

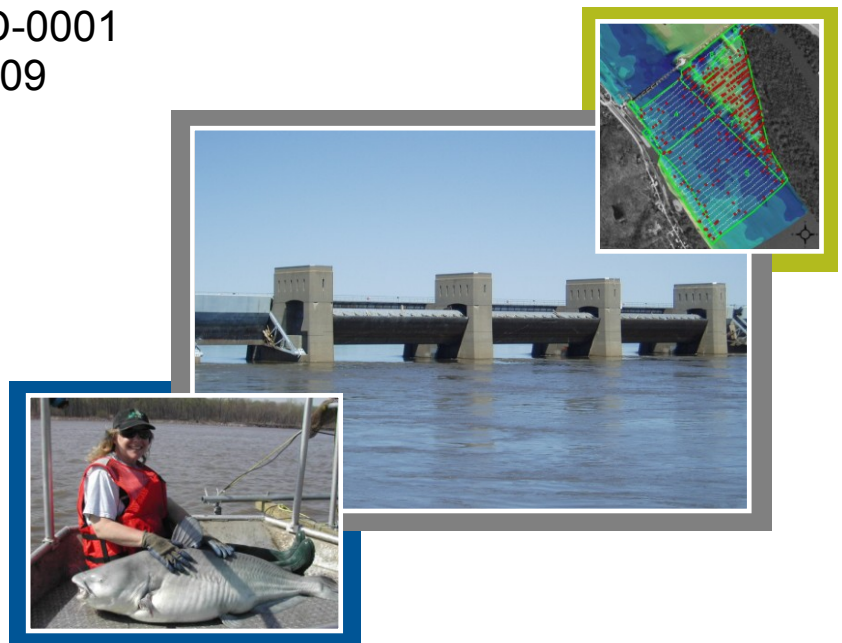
Final Independent External Peer Review Report for the Navigation and Ecosystem Sustainability Program, Project P2, Lock and Dam 22 Fish Passage Improvement Project Implementation Report

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Ecosystem Restoration Planning Center of Expertise
Rock Island Division

Contract No. W911NF-07-D-0001
Task Control Number: 09-209
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December 17, 2009



SHORT-TERM ANALYSIS SERVICE (STAS)

on

**Final Independent External Peer Review Report
Navigation and Ecosystem Sustainability Program,
Project P2, Lock and Dam 22 Fish Passage
Improvement Project Implementation Report**

by

**Battelle
505 King Avenue
Columbus, OH 43201**

for

**Department of the Army
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Scientific Services Program

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**FINAL
INDEPENDENT EXTERNAL PEER REVIEW REPORT
for the**

**Navigation and Ecosystem Sustainability Program,
Project P2, Lock and Dam 22 Fish Passage
Improvement Project Implementation Report**

EXECUTIVE SUMMARY

The Lock and Dam (L/D) 22 Fish Passage Improvement Project (PIR) is part of the Navigation and Ecosystem Sustainability Program (NESP). The project is located near Saverton, Missouri about ten miles southeast of Hannibal, Missouri in Ralls County. Lock and Dam 22 is a part of the 9-foot navigation project. Though this dam serves to impound water for navigation, it also serves as an impediment to upstream fish movement. Restoring the connectivity for migratory fishes by allowing unrestricted passage over the dam through a fishway is necessary.

The purpose of the review document NESP L/D 22 Fish Passage PIR with integrated Supplemental Environmental Assessment (SEA) and appendices is to present the results of a feasibility study undertaken to restore connectivity of the Upper Mississippi River (UMR) for a wide range of migratory warmwater fish species. This report provides planning, engineering, and implementation details of the recommended restoration plan to allow final design and construction to proceed subsequent to the approval of the plan.

USACE is conducting an independent external peer review (IEPR) of the Navigation and Ecosystem Sustainability Program, Project P2, Lock and Dam 22 Fish Passage Improvement Project Implementation Report (NESP PIR). Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to coordinate the IEPR of the NESP PIR. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2008), USACE (2007) and OMB (2004). This final report describes the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR panel.

Five panel members were selected for the IEPR from more than 39 identified candidates. Corresponding to the technical content of the NESP PIR Project, the areas of technical expertise of the five selected peer reviewers included geotechnical engineering, structural engineering, large river ecologist/fisheries biology, hydraulic engineering, and economics.

The IEPR panel was provided with electronic versions of the NESP PIR documents, along with a charge that solicited their comments on specific sections of the documents that were to be reviewed. The IEPR panel and Battelle were briefed by the NESP PIR Project Delivery Team during a kick-off meeting held via teleconference prior to the start of the review. More than 315 individual comments were received from the IEPR panel in response to the 140 charge questions.

There was no direct communication between the IEPR panel and USACE during the peer review process.

Following the individual reviews of the NESP PIR documents by the IEPR panel, a teleconference was conducted to review key technical comments, discuss charge questions for which there were conflicting responses, and reach agreement on the Final Panel Comments to be provided to USACE. The Final Panel Comments were documented according to a four-part format that included description of: (1) comment statement; (2) the basis for the comment; (3) significance of the comment (high, medium, and low); and (4) recommendations on how to resolve the comment. Overall, 16 Final Panel Comments were identified and documented. Of the 16 Final Panel Comments, 6 were identified as having high significance, 8 were identified as having medium significance, and 2 were identified as having low significance.

Table ES-1 summarizes the Final Panel Comments by level of significance. Detailed information on each comment is contained in Appendix A of this report.

Table ES-1. Overview of 16 Final Comments Identified by the NESP PIR IEPR Panel

Significance – High	
1	The operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) costs associated with the proposed management measures lack sufficient data and detail to determine a recommended alternative.
2	Critical elements of the future cost analysis lack sufficient detail and contain inconsistencies that could impact the selection of the preferred alternative.
3	The preliminary analyses of the fish passage does not fully consider all design factors including materials, permeability, stability, and associated costs which would allow evaluation and support of the selected alternative.
4	The dam safety evaluation, monitoring, and recommendations have not been fully explored with respect to the proposed project.
5	The adaptive management (\$12M) and monitoring (\$7M) costs presented appear to exceed the respective 3% and 1% limits outlined in ER1105-2-100, and the schedules of future fish passage projects are not provided to support the conclusion that the results of adaptive management and monitoring will benefit those projects.
6	The manner in which the planning principles and guidelines (P&G) criteria were merged with quantitative cost analysis to establish the recommended plan requires more detail.
Significance – Medium	
7	No information or definitive analyses are provided regarding the project's impact on scour or aggradation outside the limits of the fish passage structure which would allow evaluation and support of the development of the alternatives is provided.
8	It is unclear how the 1% annual chance flood elevation was determined for the existing conditions and the proposed alternatives and whether the effect of debris collecting on the proposed ice/debris barrier is considered in the hydraulic analysis.
9	The performance indicators provided in Chapter 3 of the NESP PIR are not sufficiently detailed to screen out alternatives.
10	The benefit of the permanent ice and debris barrier has not been justified relative to its cost.

11	In addition to low flow, the potential for fish to encounter the fish passage entrance must be evaluated under a range of flow conditions.
12	The rationale for the riffle habitat restoration does not include supporting hydraulic and substrate data.
13	Some fish species are incorrectly classified as migratory which may potentially overestimate the benefits to non-migratory fish species.
14	The discussion on American eel is misleading and the discussion on Asian carp needs to be balanced to include other invasive species.
Significance – Low	
15	It is not clear if there will be changes in sediment transport conditions and if the aquatic habitat will be impacted by these changes.
16	Specific biological goals relating to the project performance, including fishery management objectives, should be included in the fisheries discussion.

The IEPR panel generally agreed on their “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” in the NESP PIR. However, there were conflicting opinions on the preliminary design analysis for the riprap stone sizing. Two panel members believed that using three different design methods to evaluate the riprap stone size, and selecting the largest stone size for preliminary design was appropriate for this preliminary design stage. The two panel members advised that as part of the final design phase, the riprap system be re-evaluated using calculations with a range of discharges and tailwater levels to confirm or refine the findings presented in the report. However, a third panel member had the opinion that the riprap stone sizing analysis using three disparate approaches, from which the largest (most conservative) stone size was selected, may not be appropriate. This third panel member recommended that a detailed literature review and analyses of rock sizing and scour protection stability be conducted using a variety of anticipated flow conditions to validate the selection of the stone size for the riprap material. The third panel member believed that the three analyses used to size riprap may not be applicable for use in designing scour protection for the fish passage under all flow conditions.

The following statements provide a summary of the panel’s findings, which are described in more detail in the Final Panel Comments in Appendix A.

The panel members generally agreed that the NESP PIR was comprehensive and supported the goals of the project. The structural engineering design and hydraulic analysis used as a basis for the NESP PIR is appropriate for this phase of the project. However, the panel members expressed reservations about the level of geotechnical analysis, preparation of cost estimates, safety of the existing facility with the implementation of the proposed project, need for an ice/debris barrier, and the details of the economic justification.

Engineering: The panel expressed several concerns with the cost estimate prepared for the NESP PIR, including the lack of consideration of OMRR&R (operation, maintenance, repair, replacement, and rehabilitation), construction and constructability costs, and the apparent exceedence of USACE guidelines for the estimated adaptive management and monitoring costs. Although debris removal and maintenance due to high water and/or major storm events are stated as concerns in the text, the OMRR&R costs are not included in the total cost for the

recommended alternative. In addition, it is not clear if the construction costs include wet versus dry construction methods, leading to related concerns regarding the project's overall constructability. The panel questioned the need for an ice/debris barrier, citing similar projects and overall costs.

The panel also believes that the safety of the existing dam facility has not been fully evaluated with respect to the stability of the overflow spillway and future loading conditions.

The level of design for the recommended alternative is at an acceptable level with respect to the structural engineering aspects of the project. However, the geotechnical analysis lacks detail with regard to the permeability of the riprap materials and the overall local stability of the fish passage.

Economics: In general, the economic analysis was comprehensive; however, there are critical elements of the future cost analysis that lack sufficient detail. In addition, there are inconsistencies with the use of escalation factors that could impact the selection of the recommended alternative.

Environmental: The main concern raised over environmental issues was the need to evaluate the potential for fish to locate the fish passage entrance for a range of flow conditions other than the low flow.

Plan Formulation: The adaptive management and monitoring costs appear to exceed the guidelines (3% and 1%, respectively) as outlined in ER1105-2-100; however, there is no explanation given as to why the guidelines could be exceeded for this project. In addition, the benefits associated with the recommended alternative are based on the results of this project's adaptive management and monitoring supporting other future projects, and the schedules of future fish passage projects are not provided to support the conclusion that the results of adaptive management and monitoring will benefit those projects. In turn, this may lead to an over-estimate of the benefits of the project.

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LIST OF ACRONYMS

ATR	Agency Technical Review
CWCCIS	Civil Works Construction Cost Index System
EC	Engineering Circular
IEPR	Independent External Peer Review
L/D	Lock and Dam
NESP	Navigation and Ecosystem Sustainability Program
NTP	Notice to Proceed
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
OMRR&R	Operation, Maintenance, Repair, Replacement, and Rehabilitation
PED	Preliminary Engineering and Design
PIR	Project Implementation Report
SEA	Supplemental Environmental Assessment
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
WRDA	Water Resources Development Act

1. INTRODUCTION

The Lock and Dam (L/D) 22 Fish Passage Improvement Project (PIR) is part of the Navigation and Ecosystem Sustainability Program (NESP). The project is located near Saverton, Missouri about ten miles southeast of Hannibal, Missouri in Ralls County. Lock and Dam 22 is a part of the 9-foot navigation project. Though this dam serves to impound water for navigation, it also serves as an impediment to upstream fish movement. Restoring the connectivity for migratory fishes by allowing unrestricted passage over the dam through a fishway is necessary.

The purpose of the review document NESP L/D 22 Fish Passage PIR with integrated Supplemental Environmental Assessment (SEA) and appendices is to present the results of a feasibility study undertaken to restore connectivity of the Upper Mississippi River (UMR) for a wide range of migratory warmwater fish species. This report provides planning, engineering, and implementation details of the recommended restoration plan to allow final design and construction to proceed subsequent to the approval of the plan.

The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the NESP PIR in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers Engineer Circular (EC) No. 1105-2-410, *Review of Decision Documents*, dated August 22, 2008 (USACE, 2008) and the Office of Management and Budget (OMB) *Final Information Quality Bulletin for Peer Review* released December 16, 2004 (OMB, 2004). As a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, Battelle was engaged to coordinate the IEPR of the NESP PIR. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR panel on the existing environmental, economic, and hydrologic and hydraulic engineering analyses contained in the NESP PIR. Detailed information on the Final Panel Comments is provided in Appendix A.

2. PURPOSE OF INDEPENDENT EXTERNAL PEER REVIEW

To ensure that USACE documents are supported by the best scientific and technical information, a peer review process has been implemented by USACE that utilizes IEPR to complement the Agency Technical Review (ATR), as described in USACE (2008) and USACE CECW-CP Memorandum dated March 30, 2007 (USACE, 2007).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the economic, engineering, and environmental analysis of the project study. In particular, the IEPR addresses the technical soundness of the report's assumptions, methods, analyses, and calculations; and the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the NESP PIR was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) eligible under section 501(c)(3) of the U.S. Internal Revenue Code. Battelle is an independent, objective science and technology organization with experience conducting IEPRs.

3. METHODS

This section describes the methodology followed in selecting the IEPR panel members and in planning and conducting the IEPR. The IEPR was conducted following procedures described in USACE's guidance cited above (Section 2 of this report) and in accordance with OMB (2004). Supplemental guidance on evaluation for conflicts of interest was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

3.1 Planning and Schedule

In terms of planning, one of the first actions Battelle conducted after receiving the notice to proceed (NTP) was to hold a kick-off meeting between USACE and Battelle. The purpose of the meeting was to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. Due dates for milestones and deliverables in the table below are based on the NTP date of August 25, 2009. Table 1 defines the schedule followed in execution of the IEPR.

Table 1. NESP PIR IEPR Schedule

TASK	ACTION	DUE DATE
1	NTP	August 25, 2009
	Review Documents Available ^a	September 1- 14, 2009
	Prepare Draft Work Plan ^b	September 21, 2009
	USACE Provides Comments on Draft Work Plan	September 25, 2009
2	Recruit and screen up to 10 potential panel members; prepare summary information	September 15, 2009
3	Submit Draft Charge ^b	September 18, 2009
	USACE provides comments on Draft Charge	September 25, 2009
	Submit Final Work Plan including Final Charge ^b	October 6, 2009
	USACE approves Final Work Plan, including Final Charge	October 8, 2009
4	Submit list of selected panel members ^b	September 15, 2009
	USACE provides comments on list of panel members	September 22, 2009
	Complete subcontracts for panel members	October 9, 2009
5	Kick-off Meeting with USACE and Battelle	September 3, 2009
	Kick-off Meeting with Battelle and the IEPR panel	October 9, 2009

TASK	ACTION	DUE DATE
	Kick-off Meeting with USACE, Battelle and the IEPR panel	October 9, 2009
6	Review documents and charge sent to IEPR panel	October 9, 2009
	IEPR panel completes the review and provides comments to Battelle	November 6, 2009
	Merge comments from IEPR panel	November 13, 2009
	Convene consensus conference call	November 20, 2009
	Prepare Final Panel Comments	December 2, 2009
7	Submit Final IEPR Report ^b	December 17, 2009
8 ^c	Input Final Panel Comments to DrChecks	December 21, 2009
	USACE Provides Draft Evaluator Responses via e-mail (Word document)	January 8, 2010
	Conference call with USACE, Battelle and IEPR panel to discuss Final Panel Comments	January 15, 2010
	USACE inputs Final Evaluator responses to Final Panel Comments in DrChecks	February 5, 2010
	IEPR Panel Responds to USACE Evaluator Responses (Backcheck responses)	February 26, 2010
	Submit pdf of DrChecks file and Closeout of DrChecks ^b	March 1, 2010
	Project Closeout	May 3, 2010

^a Due to USACE updating review material, documents were provided to Battelle over a two week period.

^b Deliverable

^c Task occurs after the submission of this report.

Note that the work items listed in Task 8 occur after the submission of this report. The 16 Final Panel Comments will be entered in to DrChecks by Battelle for review and response by USACE and the IEPR panel. USACE will provide Evaluator Responses to the Final Panel Comments and the IEPR panel will respond to the Evaluator Responses (via Backcheck responses). All USACE and IEPR panel responses will be documented by Battelle.

3.2 Identification and Selection of Independent External Peer Reviewers

Corresponding to the technical content of the NESP PIR and overall scope of the NESP PIR project, the technical expertise areas for which the candidate panel members were evaluated focused on five key areas: geotechnical engineering, structural engineering, large river ecologist/fisheries biology, hydraulic engineering, and economics.

Battelle initially identified more than 37 candidate IEPR panel members, evaluated their technical expertise and inquired about potential conflicts of interest. Of those initially contacted Battelle chose nine of the most qualified candidates and confirmed their interest and availability. Of those nine candidates, five were proposed as the final panel and four were proposed as backup reviewers. The five proposed primary reviewers constituted the final panel. The remaining panel members were not proposed for a variety of reasons, including lack of availability, disclosed conflicts of interest, or because they did not possess the precise technical expertise required.

The candidates were screened for the following *potential* exclusion criteria or conflicts of interest.¹ Participation in previous USACE technical peer review committees and other technical review panel experience was also considered.

- Involvement by you or your firm¹ in any part of the Navigation and Ecosystem Sustainability Program (NESP) including:
 - Lock and Dam 22 Fish Passage Improvement Project,
 - Upper Mississippi River System Environmental Management Program (UMRS EMP),
 - Upper Mississippi River-Illinois Waterway System Navigation Feasibility Study
- Any involvement by you or your firm¹ in the conceptual or actual design, construction, or O&M of the Lock and Dam 22 Fish Passage Improvement Project or related projects.
- Current employment by USACE.
- Any involvement with paid or unpaid expert testimony related to the Lock and Dam 22 Fish Passage Improvement Project.
- Current or previous employment or affiliation with a cooperating agency for the Navigation and Ecosystem Sustainability Program (NESP) (e.g., USGS, US Dept. of Transportation, USDA, USFWS, USEPA, the state of Minnesota, the state of Iowa, the state of Illinois, the state of Missouri, or the state of Wisconsin) and currently working on NESP-related projects (for pay or pro bono)
- Current member of the Navigation and Ecosystem Sustainability Program's (NESP) Navigation Environmental Coordination Committee.
- Current or future interests in the subject project or future benefits from the project.
- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Rock Island District.
- Current firm¹ involvement with other USACE projects, specifically those projects/contracts that are with the Rock Island District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role.
- Previous employment by USACE as a direct employee or contractor (either as an individual or through your firm¹) within the last 10 years, notably if those projects/contracts are with the Rock Island District. If yes, provide title/description, dates

¹Note: Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See the OMB memo p. 18, "....when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.

- Other USACE affiliation [e.g., scientist employed by USACE (except as described in NAS criteria, see EC 1105-2-410 section 8d)].
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning water resource development projects involving levees, channel modifications, and pumping stations, and include the client/agency and duration of review (approximate dates).
- Current or future financial interests in Lock and Dam 22 Fish Passage Improvement Project related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm¹ revenues within the last three years came from USACE contracts.
- Any publicly documented statement made advocating for or against the Navigation and Ecosystem Sustainability Program (NESP), including the Lock and Dam 22 Fish Passage Improvement Project.
- Any other perceived COI not listed, such as:
 - Involvement in Navigation and Ecosystem Sustainability Program (NESP) projects.
 - Repeatedly served as USACE technical reviewer
 - Any other perceived COI not listed

¹Includes any joint ventures in which the candidate's firm is involved.

In selecting final panel members from the list of candidates, an effort was made to select experts who best fit the expertise areas and disclosed no conflicts of interest. Based on these considerations, five peer reviewers were selected from the potential list (see Section 4 of this report for names and biographical information on the panel members). The five reviewers selected were from academic institutions, consulting companies, or were independent engineering consultants. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of conflicts of interest through a signed conflict of interest form.

Prior to beginning their review and within three days of their subcontracts being finalized, all members of the IEPR panel were required to attend a kick-off meeting teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication, and other pertinent information for the IEPR panel.

3.3 Preparation of the Charge and Conduct of the Peer Review

A preliminary charge document, including specific charge questions and discussion points, was drafted by Battelle, reviewed and approved by USACE, and provided to the IEPR panel to guide their review of the NESP PIR. The charge was prepared by Battelle to assist USACE in the development of the charge questions that will guide the peer review, according to guidance provided in USACE (2008) and OMB (2004). The draft charge was submitted to USACE for

evaluation as part of the draft Work Plan. USACE provided minor clarifications to the final charge questions. In addition to a list of 140 charge questions/discussion points, the final charge included general guidance for the IEPR panel on the conduct of the peer review (as provided in Appendix B of this final report).

Battelle planned and facilitated a final kick-off teleconference during which USACE presented project details to the IEPR panel members. Before the kick-off meeting, the IEPR panel members were provided an electronic version of the NESP PIR documents and the final charge. A full list of the documents that were reviewed by the IEPR panel members is provided in Appendix B of this report. The IEPR panel members were instructed to address the charge questions/discussion points within a comment-response form provided by Battelle.

3.4 Review of Individual Comments

In response to the charge questions/discussion points, approximately 315 individual comments were received from the IEPR panel members. Battelle reviewed these comments to identify overall recurring themes, potential areas of conflict, and other overall impressions. As a result of this review, Battelle developed a preliminary list of 40 overall comments and discussion points that emerged from the IEPR panel members' individual comments. Each panel member's individual comments were shared with the full IEPR panel in a merged individual comments table.

3.5 Independent Peer Review Panel Teleconference

Battelle facilitated a 5-hour teleconference to provide for the exchange of technical information among the panel members, many of whom are from diverse scientific backgrounds. This information exchange ensured that this final IEPR report would accurately represent the panel's assessment of the project, including any conflicting opinions. The panel review teleconference consisted of a thorough discussion of the overall negative comments, positive comments, and comments that appeared to be conflicting among IEPR panel. In addition, Battelle used the teleconference to confirm each comment's level of significance to the panel, add any missing issues of high-level importance to the findings, resolve whether to "agree to disagree" on the conflicting comments, and to merge related individual comments into one "Final Panel Comment." The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments and to decide which panel member would serve as the lead author for the development of each Final Panel Comment.

In addition to identifying which issues should be carried forward as Final Panel Comments, the IEPR panel members discussed responses to 18 specific charge questions where there appeared to be a potential conflict of opinions among the panel members. Seventeen of the potential conflicts were resolved based on the professional judgment of the IEPR panel members. Each issue was either incorporated into a Final Panel Comment or determined to be a non-significant issue (i.e., either a true disagreement did not exist, or the issue was not important enough to include as a Final Panel Comment). One issue, however, was not resolved which resulted in a conflict among the panel. This issue is described in Section 5.

During the panel teleconference, the panel members identified 16 comments and discussion points that should be brought forward as Final Panel Comments.

3.6 Preparation of Final Panel Comments

Following the teleconference, a summary memorandum documenting each Final Panel Comment (organized by level of significance) was prepared by Battelle and distributed to the IEPR panel members. The memorandum provided the following detailed guidance on the approach and format to be used in the development of the Final Panel Comments for the NESP PIR:

- Lead Responsibility: For each Final Panel Comment, one of the IEPR panel members was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Lead author assignments were modified by Battelle at the direction of the IEPR panel members. To assist each lead in the development of the Final Panel Comments, Battelle distributed merged individual comments in the comment-response form table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and a template for the preparation of the Final Panel Comments.
- Directive to the Lead Author: Each lead author was encouraged to communicate directly with other IEPR panel members as needed, to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead author was instructed to draft a new Final Panel Comment.
- Format for Final Comments: Each Final Panel Comment was presented as part of a four-part structure, including:
 1. Comment Statement (i.e., succinct summary statement of concern)
 2. Basis for comment (i.e., details regarding the concern)
 3. Significance (high, medium, low; see description below)
 4. Recommendation for resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
 1. *High*: Describes a fundamental problem with the project that could affect the recommendation or justification of the project
 2. *Medium*: Affects the completeness or understanding of the reports/project
 3. *Low*: Affects the technical quality of the reports but will not affect the recommendation of the project.
- Guidance for Developing the Recommendation: The recommendation was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

As a result of this process, 16 Final Panel Comments were prepared. Battelle reviewed and edited the Final Panel Comments for clarity, consistency with comment statement, and adherence to guidance on the panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. There was no direct communication between IEPR panel members and USACE during the preparation of the Final Panel Comments. The Final Panel Comments were assembled and are presented in Appendix A of this report.

4. PANEL DESCRIPTION

Candidate panel members were identified using Battelle's Peer Reviewer Database, targeted Internet searches using key words (e.g., technical area, geographic region), searches of websites of universities or other compiled expert sites, and through referrals. A draft list of primary and backup candidate panel members (which were screened for availability, technical background, and conflicts of interest) was prepared by Battelle and provided to USACE. The final list of panel members was determined by Battelle.

An overview of the credentials of the final five IEPR panel members and their qualifications in relation to the technical evaluation criteria is presented in Table 2. More detailed biographical information regarding each panel member and his technical area of expertise is presented in the text that follows the table.

Table 2. NESP PIR IEPR Panel: Technical Criteria and Areas of Expertise

	Kulik	Kahl	McCaskie	Avery	Mullen
Large River Ecologist/Fisheries Biologist	X				
At least 5 years of experience in fisheries biology and/or large river ecology	X				
Familiarity with the biota of the Upper Mississippi River ecosystem	X				
Experience with fish passage on low-gradient navigable rivers	X				
Experience with natural stream channel design	X				
Experience with bio-response evaluation of large river ecosystem restoration projects	X				
Familiarity with large, complex civil works projects with high public and interagency interests	X				
Structural Engineer		X			
At least 5 years of experience in structural engineering		X			
Registered professional engineer		X			
Experience in the design and construction of bridges					
Experience in the design and construction of debris booms					
Experience in the design and construction of rock-ramp style fishways		X			
Understanding of static and dynamic fluid pressure loading associated with navigation dams on the Upper Mississippi River					
Capable of assessing if the distribution of loads on a structure and the distribution of material strength of a structure meet structural design codes		X			
Familiarity with large, complex civil works projects with high public and interagency interests		X			
Geotechnical Engineer			X		
At least 5 years of experience in geotechnical engineering			X		
Registered professional engineer			X		
Experience in the design and construction of foundations required for the construction of projects on or around navigation dams			X		
Experience in the design and construction of earthworks required for the construction of projects on or around navigation dams			X		
Experience in the design and construction of pavement sub grades required for the construction of projects on or around navigation dams			X		
Familiarity with dam safety			X		
Familiarity with the physical/mechanical and chemical properties that are relevant to large-scale construction of a rock ramp fishway on the Upper Mississippi River			X		
Familiarity with large, complex civil works projects with high public and interagency interests			X		

	Kulik	Kahl	McCaskie	Avery	Mullen
Hydraulic Engineer				X	
At least 5 years of experience in hydraulic engineering				X	
Registered Professional Engineer				X	
Experience in hydraulic engineering with an emphasis on large public works projects, associated with ecosystem restoration and natural channel design				X	
Familiarity with similar USACE hydrologic and hydraulic computer models				X	
Experience with both computer simulation and physical modeling of large river systems				X	
Economics					X
At least 5 years of experience in economics					X
Experience directly related to water resource economic evaluation or review					X
Familiarity with USACE environmental analysis and benefit calculations, including use of standard USACE computer programs					X
Familiarity with large, complex civil works projects with high public and interagency interests					X

Brandon Kulik

Role: This panel member was chosen primarily for his large river ecology and fisheries biology experience and expertise.

Affiliation: Kleinschmidt Associates

Mr. Kulik is currently a senior fisheries biologist at Kleinschmidt Associates. He received his M.S. degree in aquatic zoology from DePauw University in 1978, where his thesis focused on large river fish assemblages in the Ohio River (a major Mississippi River tributary with similar ecology) and the effects of power generation and water quality on fish distributions. Mr. Kulik has also received U.S. Fish and Wildlife Service training in Fish Passageways and Diversion Facilities. Mr. Kulik currently designs, performs, and reviews environmental studies pertaining to fish passage, ecology, instream flow, and aquatic habitat. Primary responsibilities include leading agency consultation for scoping, design, and execution of study plans; negotiation of resolutions for issues including water quality, aquatic habitat, and fish passage; managing the collection and analysis of environmental and fisheries data; preparation of related environmental exhibits required for license application and permit documents; and providing biological input to the engineering design of fishways. A significant amount of his current workload specifically pertains to bio-response evaluations of large river ecosystems to fish passage, habitat, and water quality changes. Mr. Kulik is familiar with natural stream channel design based on his work on fish passage issues at over 30 hydroelectric dams since 1985 including conducting and designing studies, writing Environmental Assessments, and working on interdisciplinary engineering teams and with fishery management and regulatory agencies. Mr. Kulik has also provided significant expert witness testimony on instream flow and fish passage issues. In addition, he is an active member of the American Fisheries Society and a recent past president of the Atlantic International Chapter. He has published and presented papers at professional meetings on habitat-based instream flow regulation, fish entrainment and passage, habitat protection, instream flows, riverine fish community dynamics and estuarine ecology.

Tom Kahl

Role: This panel member was chosen primarily for his structural engineering experience and expertise.

Affiliation: Kleinschmidt Associates

Tom Kahl (Structural Engineer): Mr. Kahl is currently a senior design engineer and project manager with Kleinschmidt Energy and Water Resource Consultants in Pittsfield, ME. He earned his M.S. in structural engineering from the University of Colorado in 1976 and is a registered professional engineer in six states (ME, NH, VT, WA, PA, and NJ). Since joining Kleinschmidt in 1985, his experience has focused on the planning, evaluation, rehabilitation, and construction of hydroelectric projects. Mr. Kahl's specific activities and responsibilities have included feasibility studies, functional layout, structural design, specification writing, and construction monitoring for the building and rehabilitation of most types of hydroelectric related structures including powerhouses, dams, spillways, gates, intakes, foundations, penstocks, cofferdams, and fishways. Mr. Kahl has presented technical papers at various seminars including Waterpower's 1989 through 2009; EPRI; Hydro Vision 1998, 2004, 2006, 2008; and ASCE conferences. He has published numerous technical articles on various aspects of hydroelectric design and construction including penstocks, spillway crest control, and fishways. He has been a

technical reviewer of articles for *Hydro Review* magazine, a member of the ASCE review committees for the “Manual of Steel Penstocks.” and a member of the ASCE Task Committees that published technical guidelines for penstock inspection. He is presently preparing a manual on evaluating water control gates. Mr. Kahl is a member of the American Society of Civil Engineers, American Institute of Steel Construction, and the National Hydropower Association. He was a member of a FERC-approved Board of Consultants to provide a technical evaluation of the proposed construction of a new 50 MW power station at the USACE New Cumberland Hydroelectric Dam on the Ohio River.

Stephen McCaskie

Role: This panel member was chosen primarily for his geotechnical engineering experience and expertise.

Affiliation: Hanson Professional Services, Inc.

Mr. McCaskie is a Project Manager / Senior Geotechnical Engineer at Hanson Professional Services, Inc. in Missouri. He earned an M.S. in civil engineering from Carnegie-Mellon University and is a licensed professional engineer in five states (IL, KS, MO, FL, and CA). He has experience in project management; engineering and QA/QC of flood protection, water resources, transportation, inland navigation, underground, and port and harbor projects; planning, conducting and supervising subsurface explorations, condition surveys/evaluations/assessments, safety inspections, foundation analysis and design, and construction monitoring and inspection; operations and maintenance; specialized foundation analyses; earth dam/levee and embankment design, instrumentation, data collection, and analyses; soil-structure interaction; and earthquake engineering. One of Mr. McCaskie’s characteristic projects included dam and spillway improvements to the Busch Wildlife Lake No. 35 in Missouri. He acted as the project principal for design and project manager during construction, which required a dam raise and spillway upgrade to meet Hazard Class I standards due to increasing downstream development. Services provided included: site reconnaissance; geotechnical exploration; watershed analyses and hydrologic and hydraulic modeling using HEC-HMS and HEC-RAS; analysis and design of dam raise and improvements; hydraulic analyses of the modified spillway and cost estimates; spillway and erosion protection analyses and design; borrow evaluations; rock blasting and excavation analyses; preparation of construction drawings and specifications; permit applications for land disturbance and dam operation of the upgraded structure; and construction monitoring. Services also included development and preliminary design of two alternates for the addition of a fish barrier in the principal spillway of the dam. He is a member of the United States Society on Dams and the Association of State Dam Safety Officials.

Kenneth Avery

Role: This panel member was chosen primarily for his hydraulic engineering experience and expertise.

Affiliation: Bergmann Associates, Inc.

Mr. Avery is currently a senior hydrologic and hydraulic engineer with Bergmann Associates, Inc. in Rochester, NY. He earned his M.S. in water resources engineering from Clarkson University in 1977 and is a registered professional engineer in five states (MI, MN, NY, FL, and MT). Mr. Avery has 32 years of experience in water resources, environmental, and civil

engineering. In the field of water resources, his experience encompasses planning, engineering, and design. His principle disciplines of concentration include surface water hydrology, open and closed channel hydraulics, revetment, bridge and channel scour, and sediment transport. Mr. Avery has utilized steady and unsteady flow hydraulic models including: the HEC and NWS software, LIQT, DYNLET, SWMM and KYPIPES, among others. His design experience covers hydraulic structures, dams, sewers, highway and bridge hydraulics, penstocks, natural channels, and riprap revetment. Mr. Avery's relevant experience includes being the project manager and lead hydrologist for the Chase-Hibbard Dam Fish Ladder and Portage Study in Elmira, NY. The fish ladder project included: hydrologic analysis of discharges to determine operational hydraulic requirements for the fish ladder during the migration season, high flow conditions, and low flow conditions; determination of target fish species; review of a previous denile fish ladder design; cost estimating; and conceptual design. As a channel design expert, Mr. Avery served as project manager for the engineering and design of a 2000-foot long section of Minisceongo Creek. The creek had experienced severe channel erosion, including failure of gabion sections, slope failures, and collapse of drainage outfall pipes. Mr. Avery developed a repair strategy, prepared plans, specifications, permits and cost estimates to repair the primary damage area. He has conducted physical hydraulic modeling (including for Control Structure 46 for the Monroe County Dept. of Engineering in Rochester, NY) and his career has included extensive work with dams, locks, spillways, and outlet works.

Jeff Mullen

Role: This panel member was chosen primarily for his economics experience and expertise.

Affiliation: University of Georgia

Dr. Mullen is currently an associate professor in the Department of Agricultural and Applied Economics at the University of Georgia. He earned his Ph.D in agricultural and applied economics from Virginia Polytechnic Institute in 1999. Dr. Mullen has conducted numerous non-market valuation studies measuring ecological, aesthetic, and human health costs and benefits associated with changes in both water quality and water quantity. He has also conducted many studies using direct market valuation. His technical experience includes benefit-cost analysis, hedonic analysis, contingent valuation, benefits transfer, travel cost method, habitat equivalency analysis, fish passage efficiency, and econometrics. He also has experience with USACE computer programs, including the IWR-MAIN program for estimating municipal and industrial water needs and teaches courses involving federal benefit-cost methodologies, including those used by USACE. Other courses he has taught include econometrics, water resource economics, environmental economics and policy, production economics, and natural resource economics. He has reviewed numerous articles for peer-reviewed journals concerning municipal, wastewater treatment, irrigation, and water impoundment projects. Dr. Mullen has provided expert testimony on assessing the economic damages due to lake sedimentation and dam repairs in Mountain Park, Georgia. His textbook *Water Resource Economics* (Routledge Press) is forthcoming.

5. RESULTS — SUMMARY OF PEER REVIEW COMMENTS

The IEPR panel generally agreed on their “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” in the NESP PIR. However, there were conflicting opinions on the preliminary design analysis for the riprap stone sizing. Two panel members believed that using three different design methods to evaluate the riprap stone size, and selecting the largest stone size for preliminary design was appropriate for this preliminary design stage. The two panel members advised that as part of the final design phase, the riprap system be re-evaluated using calculations with a range of discharges and tailwater levels to confirm or refine the findings presented in the report. However, a third panel member had the opinion that the riprap stone sizing analysis using three disparate approaches, from which the largest (most conservative) stone size was selected, may not be appropriate. This third panel member recommended that a detailed literature review and analyses of rock sizing and scour protection stability be conducted using a variety of anticipated flow conditions to validate the selection of the stone size for the riprap material. The third panel member believed that the three analyses used to size riprap may not be applicable for use in designing scour protection for the fish passage under all flow conditions.

The following statements provide a summary of the panel’s findings, which are described in more detail in the Final Panel Comments in Appendix A.

The panel members generally agreed that the NESP PIR was comprehensive and supported the goals of the project. The structural engineering design and hydraulic analysis used as a basis for the NESP PIR is appropriate for this phase of the project. However, the panel members expressed reservations about the level of geotechnical analysis, preparation of cost estimates, safety of the existing facility with the implementation of the proposed project, need for an ice/debris barrier, and the details of the economic justification.

Engineering: The panel members expressed several concerns with the cost estimate prepared for the NESP PIR, including the lack of consideration of operation, maintenance, repair, replacement, and rehabilitation (OMRR&R), construction and constructability costs, and the apparent exceedance of USACE guidelines for the estimated adaptive management and monitoring costs. Although debris removal and maintenance due to high water and/or major storm events are stated as concerns in the text, the OMRR&R costs are not included in the total cost for the recommended alternative. In addition, it is not clear if the construction costs include wet versus dry construction methods, leading to related concerns regarding the project’s overall constructability. The panel members questioned the need for an ice/debris barrier, citing similar projects and overall costs.

The panel members also believe that the safety of the existing dam facility has not been fully evaluated with respect to the stability of the overflow spillway and future loading conditions.

The level of design for the recommended alternative is at an acceptable level with respect to the structural engineering aspects of the project. However, the geotechnical analysis lacks detail with regard to the permeability of the riprap materials and the overall local stability of the fish passage.

Economics: In general, the economic analysis was comprehensive; however, there are critical elements of the future cost analysis that lack sufficient detail. In addition, there are inconsistencies with the use of escalation factors that could impact the selection of the recommended alternative.

Environmental: The main concern raised over environmental issues was the need to evaluate the potential for fish to locate the fish passage entrance for a range of flow conditions other than the low flow.

Plan Formulation: The adaptive management and monitoring costs appear to exceed the guidelines (3% and 1%, respectively) as outlined in ER1105-2-100; however, there is no explanation given as to why the guidelines could be exceeded for this project. In addition, the benefits associated with the recommended alternative are based on the results of this project's adaptive management and monitoring supporting other future projects, and the schedules of future fish passage projects are not provided to support the conclusion that the results of adaptive management and monitoring will benefit those projects. In turn, this may lead to an over-estimate of the benefits of the project.

Table 3. Overview of 16 Final Panel Comments Identified by the NESP PIR IEPR Panel

Significance – High	
1	The operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) costs associated with the proposed management measures lack sufficient data and detail to determine a recommended alternative.
2	Critical elements of the future cost analysis lack sufficient detail and contain inconsistencies that could impact the selection of the preferred alternative.
3	The preliminary analyses of the fish passage does not fully consider all design factors including materials, permeability, stability, and associated costs which would allow evaluation and support of the selected alternative.
4	The dam safety evaluation, monitoring, and recommendations have not been fully explored with respect to the proposed project.
5	The adaptive management (\$12M) and monitoring (\$7M) costs presented appear to exceed the respective 3% and 1% limits outlined in ER1105-2-100, and the schedules of future fish passage projects are not provided to support the conclusion that the results of adaptive management and monitoring will benefit those projects.
6	The manner in which the planning principles and guidelines (P&G) criteria were merged with quantitative cost analysis to establish the recommended plan requires more detail.
Significance – Medium	
7	No information or definitive analyses are provided regarding the project's impact on scour or aggradation outside the limits of the fish passage structure which would allow evaluation and support of the development of the alternatives is provided.
8	It is unclear how the 1% annual chance flood elevation was determined for the existing conditions and the proposed alternatives and whether the effect of debris collecting on the proposed ice/debris barrier is considered in the hydraulic analysis.
9	The performance indicators provided in Chapter 3 of the NESP PIR are not sufficiently detailed to screen out alternatives.
10	The benefit of the permanent ice and debris barrier has not been justified relative to its cost.
11	In addition to low flow, the potential for fish to encounter the fish passage entrance must be evaluated under a range of flow conditions.
12	The rationale for the riffle habitat restoration does not include supporting hydraulic and substrate data.
13	Some fish species are incorrectly classified as migratory which may potentially overestimate the benefits to non-migratory fish species.
14	The discussion on American eel is misleading and the discussion on Asian carp needs to be balanced to include other invasive species.
Significance – Low	
15	It is not clear if there will be changes in sediment transport conditions and if the aquatic habitat will be impacted by these changes.
16	Specific biological goals relating to the project performance, including fishery management objectives, should be included in the fisheries discussion.

6. REFERENCES

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APPENDIX A

Final Panel Comments

on the

**NESP Project
Implementation Report**

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Final Panel Comment 1:

The operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) costs associated with the proposed management measures lack sufficient data and detail to determine a recommended alternative.

Basis for Comment:

The information presented and references cited in the Fish Passage Improvement Project Implementation Report (NESP PIR) regarding the OMRR&R for the recommended alternative are inconsistent and conflicting. Although the fish lockage alternative includes lock rehabilitation costs (Ch.6, pg. 1), the NESP PIR does not include rehabilitation costs for the recommended alternative (“...assumed no operational costs or rock replacement for the fishway...”,[Appendix C, pg. C-4]). The use of zero operational costs in the total cost estimate is inconsistent with the report’s statement that reconstructive work may significantly exceed “annual O&M...caused by major storms or events” (Ch.7, pg.1 2). The NESP PIR does not differentiate between the required OMRR&R for the fish passage (with a project life of 50 years) and for the 10-year, high water, and major storm events.

The NESP PIR cites the following OMRR&R costs that are not included in the total cost estimate. These costs are not consistent with the use of a zero operational cost for the recommended alternative.

Debris Removal (Ch.4, pg. 16): “...operations personnel will work on debris removal...this does not include debris removal after a major event which would fall under the area of rehabilitation...If there is a major event...possible that rock or boulders are displaced or removed , or the sand fill is scoured ...addressed under...rehabilitation.”

General Maintenance (Appendix C, pg. C-4): “Maintenance will be required for ...debris removal...high water event will occur every 10 years...”.

Annual Maintenance (Ch.7, pg. 15): “Rock realignment and replace rock lost in riffles 10-yr high flow event...\$3,965 Annual PV cost...Debris removal on an annual basis...\$85,745 Annual PV cost...”.

General Operations and Maintenance: The following statements and references are not consistent and do not in all cases support the NESP PIR OMRR&R costs used:

- Ch. 7, pg. 10 (DVWK, 2002): “Nature-like fish passage structures...require much less frequent maintenance.....”.
- Ch. 7, pg. 10 (Wildman [USACE oral communication, February 15, 2007]): “...O&M associated with rock ramps is not well documented... there is relatively little work required, occasionally...relocating placed rock that has been mobilized...not located any documentation of rock ramp O&M costs.”
- Ch. 7, pg. 11 (Aadland [USACE oral communication, no date provided]): “...in general O&M costs have been very minimal, and no rock replacement or movement has been necessary... There will be maintenance costs associated with debris removal...require debris removal maintenance annually and more significant debris removal every ten years...high water event...”.

Significance – High:

More detailed OMRR&R cost information is necessary in order to justify the selection of the recommended alternative.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- A more detailed and better supported accounting of OMRR&R costs for all conditions (including high water/flood frequencies) expected during the life of the project.
- A more consistent accounting and evaluation of OMRR&R costs for all alternatives using common bases (i.e., lock rehabilitation versus no fish passage rehabilitation) and life cycles (i.e., 15-yr lock rehabilitation cycle versus 50-yr fish passage life without rehabilitation).

Final Panel Comment 2:

Critical elements of the future cost analysis lack sufficient detail and contain inconsistencies that could impact the selection of the preferred alternative.

Basis for Comment:

Escalation factors are used to account for future price changes when conducting cost analyses. The magnitude of these factors has a direct impact on cost estimates for future activities. As the escalation factor increases, the cost estimate for a project increases, *ceteris paribus*. Escalation factors used in cost analyses for USACE projects are derived from the Civil Works Construction Cost Index System (CWCCIS). Due to the impact these factors have on estimated costs, and the subsequent selection of preferred alternatives, it is important to document the source of the index numbers used to derive them, to use the most recent indices available, and to derive the escalation factors from the source material. The NESP PIR has incomplete documentation of the source material, refers to out-dated indices, and employs escalation factors whose magnitude cannot be verified using available indices. This raises questions about the accuracy of the cost analysis and the subsequent selection of the preferred alternative based on that analysis.

Appendix C (pg. C-1) states that the CWCCIS was updated on March 31, 2008. The NESP PIR Review Draft was completed in September 2009. However, the most recent Index should be used in the cost analysis.

According to Appendix C (Attachment 4, pg. ii), Preliminary Engineering and Design (PED) falls under feature 30 of the CWCCIS, and Construction Management falls under feature 31. In the NESP PIR, there is no reference material for the Index numbers used for features 30 and 31. The panel has not been able to locate indices for those features. If a citation is available, it must be provided. If a citation is not available, the justification for the values of the Index numbers for features 30 (PED) and 31 (Construction Management) used in the cost analysis must be documented in full.

In addition to incomplete documentation of the source of Index numbers, the magnitude of the Index numbers (and the escalation factors derived from the Index numbers) used in the Cost Analysis are not justified. The index numbers in the CWCCIS have been revised significantly downward for FY09 and beyond due to the economic downturn that began in 2008. These revisions occurred March 31, 2009, and again on September 30, 2009. In Appendix C (Attachment 4, pg. iii and iv), the Phase 1 escalation factor for PED is 2.81, while the factor for Construction Management is 3.2. Likewise, in Phase 2, the escalation factor for PED is 5.44, while the factor for Construction Management is 6.85. Using the Start Date and End Date in Appendix C (Attachment 4, pg. iii and iv) for PED and Construction Management, and the quarterly CWCCIS composite indices from the September 2009 CWCCIS update, the escalation factors are 0.60, 0.85, 2.49, and 5.08 for Phase 1 PED, Phase 1 Construction Management, Phase 2 PED, and Phase 2 Construction Management, respectively. These are considerably lower than the escalation factors used in the analysis and could affect

the selection of the recommended alternative. (The CWCCIS index numbers referenced are available at <http://140.194.76.129/publications/eng-manuals/em1110-2-1304/entire.pdf>, pg. A-19 and A-20.)

In footnotes to Tables 6-9 and 6-10, the NESP PIR states annualized costs are determined based on a discount rate of 4.875%. In Appendix C, Attachment 1, the discount rate used is 4.625%. When discounting future costs and benefits, a single discount rate must be used throughout the project. If more than one discount rate is used, then the analysis is implicitly asserting that the value of \$1 in costs or benefits in year X varies. (Ch. 6, pg. 10 vs. Appendix C, pg. C-8) (Construction Management) used in the cost analysis must be documented in full.

Significance – High:

The NESP PIR contains discrepancies in escalation factors and discount rates for estimating costs that may impact the cost comparison of the alternatives.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- A citation for the index numbers used for features 30 and 31.
- Documentation on how escalation factors were calculated and full citations for reference materials used.
- An updated Index to the March 31, 2009 (or September 30, 2009) numbers or an explanation as to why earlier indices are used.
- The use of the discount rate that coincides with the Federal Project Evaluation and Formulation Rate (Discount Rate) for fiscal year 2009. See, for example, http://www.usace.army.mil/CECW/PlanningCOP/Documents/egms/egm09_01.pdf, or explain why different discount rates are justified.

Final Panel Comment 3:
The preliminary analyses of the fish passage do not fully consider all design factors including materials, permeability, stability, and associated costs which would allow evaluation and support of the selected alternative.
Basis for Comment:
<p>The analyses presented in the NESP PIR are incomplete, sometimes conflicting, and may be insufficient to determine a preferred alternative.</p> <p><u>Materials:</u> The riprap size and rock fill foundation materials have not been reviewed for their compatibility or stability and may allow piping or seepage through the fish passage.</p> <p><u>Permeability:</u> The NESP PIR contains conflicting statements regarding the materials required for the fish passage embankment. Appendix G (pg. G-3) states that: "...fish passage embankments will be constructed with rock-fill materials...well-graded quarry run shot rock...and a relatively low percentage of finer material since initial placement will be underwater. The riprap will be choked with the dredged sand up to the top surface to prevent seepage through the rocks." However, Appendix H, (pg. H-28) states that "Losing too much flow through the rock would affect the functionality and possibly stability of the structure. The core of the structure must be designed such that the material itself or a layer between the core and riprap is relatively impermeable." Overtopping and seepage through the fish passage will scour away the dredged sand material and wash out any finer material. Based on this information, the fish passage embankments are expected to be pervious and may not "hold" water.</p> <p><u>Stability:</u> Global stability of the fish passage structure is not expected to be a problem, but local slope stability, internal stability, settlement, riprap displacement, and material loss (with time and as a result of high water or major events) are more critical. However, piping, internal stability, seepage analyses, exit gradients, or associated factors of safety are not presented in Appendix G, (pg. G-5). In addition, the seepage factors of safety and exit gradients through the fish passage embankment and beneath the control/overflow section have not been evaluated. Given the expected wide range of properties of in-place materials, a sensitivity study should be conducted to evaluate the slope stability and seepage of the fish passage.</p> <p>Chapter 7 of the NESP PIR includes conflicting statements which present conflicting objectives regarding monitoring during construction and overall dam safety, including the following:</p> <ul style="list-style-type: none"> ▪ (Ch. 7, pg. 4): "...normal construction techniques should adequately protect the dam" contrasts with (Ch. 7, pg. 4) "During the Plans and Specifications phase, detailed action to ensure dam safety will be created and implemented."
Significance – High:
Fish passage design and construction requirements and costs may influence the selected alternative and the justification of the project.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- An evaluation of fish passage embankment local stability, settlement, displacement, and potential loss of riprap or embankment materials due to seepage.
- A sensitivity study for slope stability and seepage given the expected range of properties of in-place materials and as-constructed geometries.
- The analysis used to evaluate scour, stability, and survivability of the fish passage should include all design flow conditions to be encountered during the project design life (50 years).
- A monitoring plan for both the overflow structure and fish passage with established metrics for action and repair including integration within the adaptive management plan / experiment and the associated costs.

Final Panel Comment 4:

The dam safety evaluation, monitoring, and recommendations have not been fully explored with respect to the proposed project.

Basis for Comment:

The design of the proposed fish passage requires modification of the existing overflow spillway. As stated in Section 7.2.6 of the NESP PIR, “Dam safety is a serious consideration for any modification to the dam or spillway.” The only reference to the safety of the existing spillway is in Section 7.2.6 of the NESP PIR, which states that the project alternatives were reviewed by the Rock Island District Dam Safety Officer and the Chiefs of Geotechnical Branch and Structural Engineering Section and it was in their judgment that “normal construction techniques” developed during the Plans and Specifications phase should “ensure dam safety.” This statement does not provide sufficient information to evaluate the dam safety implications of the proposed fish passage. Specifically:

- The NESP PIR does not describe the construction, type, and stability of the existing overflow spillway that will be adapted to the new proposed fish passage. From a review of Photographs I-1 through I-3 in Appendix I and S19, S23, and S30 in the NESP PIR, the section of the spillway to be modified for the proposed fish passage appears to be comprised of a sheet pile core wall with upstream and downstream sloping embankments, but a clear unambiguous description of the existing structure is necessary to have an accurate understanding.
- Of particular interest is understanding if the sheet pile cell portion of the existing spillway is adequate as a stand-alone gravity dam section, or if the cell’s function is only as a core wall and requires the upstream and/or downstream embankments to either provide permeability resistance and/or stability mass. The NESP PIR should include discussion of the existing spillway’s components that are necessary to provide adequate spillway stability and the existing spillway’s factors of resistance to sliding and overturning.
- It appears from the drawings showing the proposed fish passage on Plates S18, S19, and S23 that the top of the new proposed CON/SPAN bridge will have upstream stoplog panels and be 5 ft higher than the top of the existing spillway. With the panels installed, this higher elevation will result in increased lateral forces on the existing cellular cofferdams that provide the foundation for the new CON/SPAN bridge superstructure. While the construction Plans and Specifications phase would show any detailed mitigation, the NESP PIR should at least define all changes to the existing spillway’s loading conditions.
- Depending on the purpose and construction of the upstream and downstream cell embankments, the NESP PIR should identify the dam safety requirements for the completed new fish passage, including identifying any measures that may need to be incorporated to protect the adjacent existing structures.

Significance – High:

A key aspect of the proposed fish passage facility is that the proposed structural modifications cannot jeopardize the long term safety of the existing spillway; lack of consideration of these design issues could result in an uncontrolled breach or serious damage to the existing dam.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- A review of the existing construction, type, stability, and stability considerations of the existing overflow spillway that will be adapted to the proposed new fish passage.
- A qualitative discussion of any change in loading conditions that the proposed new fish passage would have on the existing facility.

Final Panel Comment 5:

The adaptive management (\$12M) and monitoring (\$7M) costs presented appear to exceed the respective 3% and 1% limits outlined in ER 1105-2-100, and the schedules of future fish passage projects are not provided to support the conclusion that the results of adaptive management and monitoring will benefit those projects.

Basis for Comment:

The cost guidelines in ER 1105-2-100 (and excerpted on pg. 9-1 of the NESP PIR) state that for non-cost shared projects, the cost of monitoring included in the total project cost shall not exceed 1% of the total first cost of ecosystem restoration features. The cost of the adaptive management action is limited to 3% of the total project cost excluding monitoring costs.

The NESP PIR presents a total project cost of \$66M (Table 7-9), with a total first cost of \$47M (Table 7-6), a Total Monitoring Cost of \$7M (Table 7-9), and a Total Adaptive Management Cost of \$12M (Table 7-9). Using this cost data, the following upper limits on adaptive management and monitoring costs were calculated:

Upper limit of adaptive management cost = $0.03 * (\$66M - \$7M) = \$1.8M$ vs. \$12M

Upper limit of monitoring costs = $0.01 * \$47M = \$470K$ vs. \$7M

Based on this information, the project exceeds the cost guidelines.

The NESP PIR project includes benefits to future fish passage projects located in other parts of the Upper Mississippi River. However, post-construction monitoring and adaptive management is not scheduled to be completed until 2019 (see NESP PIR, Table 9-1 for schedule). The results of this effort are not likely to be available to project developers of fish passage projects at the four other Upper Mississippi River locations based on the information provided. Some studies listed in Table 9-1 (e.g., Objective 3 – Systemic Ecological Response by Migratory Fishes) may not provide useful feedback as rapidly as assumed and may require longer time lines, and/or may not need to be conducted annually.

Significance – High:

The adaptive management and monitoring costs are not in compliance with USACE cost guidelines. The benefits are based on the results of this project supporting future projects, yet the schedules of future fish passage projects are not provided to support this conclusion. Therefore, the benefit may be over-estimated.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- Further discussion and calculations showing how the project's adaptive management and monitoring costs are compliant with ER 1105-2-100.
- Further discussion of the monitoring and adaptive management experiences at other fish passage projects (some of which are referenced in the NESP PIR) to determine the duration of time required to collect, analyze, and apply results from the various types of studies (hydraulic performance, fish movement, ecological system response, structural integrity) to other projects.

- Further discussion of why previous monitoring and adaptive management studies conducted in other locations of the country would not provide sufficient data for Upper Mississippi River fish passage locations.
- Further discussion of the specific potential cost savings that monitoring and adaptive management at Lock and Dam 22 (L/D 22) could provide to future fish passage projects included in the NESP.
- Further discussion of the schedules for implementation of future fish passage projects in the NESP PIR and how the results from L/D 22 monitoring and adaptive management can be extracted and incorporated into the design schedules of these projects.

Final Panel Comment 6:

The manner in which the planning principles and guidelines (P&G) criteria were merged with quantitative cost analysis to establish the recommended plan requires more detail.

Basis for Comment:

The ability of each alternative to meet the four P&G criteria – acceptability, completeness, effectiveness, and efficiency – is rated either High, Moderate, or Low (Ch. 6, Table 6-12, pg. 17). The NESP PIR does not provide the rationale for assigning ratings to the acceptability, completeness, and efficiency criteria.

Chapter 3 of the NESP PIR states four site specific objectives (Table 3-1, pg. 9):

1. Increase the abundance and spatial distribution of all native migratory fish populations (biota);
2. Provide rock rapids and riffle habitat for fish spawning and for macroinvertebrates (geomorphology and biochemistry);
3. Increase habitat corridors and connectivity opportunities for migration of native fish and mussel populations (habitats);
4. Implement a science-based monitoring and adaptive strategy for all project phases.

Table 6-12 states alternative B0E2F0 meets objectives 1, 2, and 3, but fails to meet objective 4. The basis for concluding that this alternative would fail to meet objective 4 is not provided. The Recommended Plan could change if alternative B0E2F0 actually does meet objective 4.

In addition, the criteria used to compare the best buy alternatives is inconsistent:

- When comparing alternative B0E2F0 with alternative B0E3F0, the P&G criteria, risk and uncertainty, and the scope of adaptive management and monitoring possibilities all appear to be important factors.
- When comparing alternative B0E3F0 with alternative B1E3F0, the Incremental Cost Analysis (ICA) appears to be of paramount importance.

Significance –High:

Selection of the Recommended Plan should be based on complete information and criteria that are evaluated consistently.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- An explanation of why alternative B0E2F0 fails to meet objective 4.
- An explanation of why the ICA is less important when comparing alternative B0E2F0 with B0E3F0 than it is when comparing B0E3F0 with B1E3F0.
- An explanation of the role of risk and uncertainty when determining the preferred alternative.
- An explanation of the rationale for assigning ratings for the P&G criteria to each of the alternatives listed in Table 6-12.

Final Panel Comment 7:
No information or definitive analyses are provided regarding the project's impact on scour or aggradation outside the limits of the fish passage structure which would allow evaluation and support of the development of the alternatives.
Basis for Comment:
<p>The NESP PIR does not include information or definitive analyses on scour or aggradation outside the limits of the improvements such as outside the toe or limits of fish passage embankment, downstream of the fish passage, upstream of the control or over flow section, etc. Despite the existing scour hole located downstream of spillway (Ch.7, pg. 3; Ch.9, pg. 11), no information is provided on the scour history, patterns, or associated OMRR&R for the existing lock and dam. The proposed fish passage construction, which may fill in this existing scour hole, could possibly cause scour to occur at different locations which could lead to unanticipated OMRR&R costs, unintended consequences on fish passage performance, fish passage instability, or dam safety concerns.</p> <p>The "hydraulic conditions survey" is identified (Ch.9, pg. 20-21) as a component of the adaptive management plan and experiments. This survey addresses flow conditions relative to fish passage, but does not include monitoring of scour or aggradation outside the limits of the fish passage, or any planned response measures.</p>
Significance – Medium
Scour potential for the management measures may influence the selected alternative and the justification of the project.
Recommendations for Resolution:
<p>To resolve these concerns, the report would need to be expanded to include:</p> <ul style="list-style-type: none"> ▪ An evaluation of the noted existing scour hole and its likely cause and mitigation. ▪ An evaluation of the potential scour and scour patterns due to the management measures being considered and any potential mitigation necessary. ▪ A post-construction scour monitoring and response plan as part of the adaptive management plan/experiments.

Final Panel Comment 8:

It is unclear how the 1% annual chance flood elevation was determined for the existing conditions and the proposed alternatives and whether the effect of debris collecting on the proposed ice/debris barrier is considered in the hydraulic modeling.

Basis for Comment:

Federal projects must comply with Executive Order (E.O.) 11988, which cites the National Flood Insurance Program (NFIP) minimum requirements (1.0-foot maximum increase for the 1% annual chance flood). In turn, the NFIP allows states to set more stringent requirements. The Illinois Department of Natural Resources (DNR) has set a requirement of a 0.10-foot increase for the 1% annual chance flood. The various sections of the NESP PIR that address E.O. 11988, the NFIP, and Illinois DNR requirements are not tied together, lack sufficient detail, and leave several questions unanswered. Although Section 7.2.8 of the NESP PIR provides the most comprehensive discussion, the summary of this discussion is not included in other sections of the report. The NESP PIR uses a maximum rise of 0.04 feet in the NFIP 1% annual chance flood elevation, based on the Illinois DNR standard (cited as the most restrictive of the two adjoining states), as the reasonable standard to apply to the report's evaluation. However, the discussion of how the hydraulic modeling was performed, whether a floodway analysis is required, and the sensitivity of flooding to accumulation of ice and debris on the ice/debris barrier is missing.

The Federal Emergency Management Agency (FEMA) NFIP effective map panel 170551 0075B, "Pike County – Unincorporated Areas", dated January 3, 1986

(http://map1.msc.fema.gov/idms/IntraView.cgi?ROT=0&O_X=11262&O_Y=3146&O_ZM=0.157296&O_SX=1120&O_SY=547&O_DPI=400&O_TH=25152278&O_EN=25186790&O_PG=1&O_MP=1&CT=0&DI=0&WD=14826&HT=10172&JX=1259&JY=607&MPT=0&MPS=0&ACT=4&KEY=25151953&ITEM=1&PICK_VIEW_CENTER.x=569&PICK_VIEW_CENTER.y=93.5) provides the following background information:

- The 1% annual chance flood elevation at Lock and Dam 22 (L/D 22) is 471.5 feet (NGVD 29);
- There is no regulatory floodway, therefore floodway regulations do not apply;
- The area is located in an A10 zone and the floodplain on the Illinois side is 3600 feet wide.

Regarding flooding impacts, Section 7.2.8 of the NESP PIR states that with the CON/SPAN bridge and fixed ice/debris barrier, the computed 100-year flood stage increases 0.04 feet, but for larger fishway widths, it was determined that the Illinois DNR flood impact criteria would not be met. The calculated rise for the 300-foot bottom width fish passage channel was reported as 0.06 feet. The last paragraph in Section 7.2.8 confirms that the 200-foot bottom width fish passage channel with the fixed ice/debris barrier is the widest that can be constructed and still meet Illinois DNR regulatory floodplain requirements.

Compliance with NFIP requirements is typically performed by using and modifying the FEMA effective hydraulic model to incorporate the proposed revisions and then testing the model with the proposed revisions using the 1% annual chance flood. It is not stated how the analysis was performed (what HEC-RAS model, where cross section data was obtained from, whether a

floodway analysis was required, whether ice/debris collection at the proposed ice/debris barrier was considered). Given that the floodplain is 3600 feet wide on the Illinois side alone, it seems unlikely that a 200 or 300-foot wide fishway that removes a portion of the fixed crest of the dam would cause a 0.04 to 0.06 foot rise in the 1% annual chance water surface elevation. A sensitivity analysis should be performed for collection of ice and debris on the ice/debris barrier to ensure that the Illinois DNR floodway requirements will not be violated under sub-optimal conditions.

Significance – Medium:

The NESP PIR floodplain discussion should include the method used to conduct the pre- and post project hydraulic analysis to ensure E.O. 11988 and NFIP compliance, and a sensitivity analysis to assess the potential effects of material collecting on the ice/debris barrier, in order to determine the impact on the FEMA regulatory 1% annual chance flood elevation.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- Reference to the effective FEMA maps and Zones for both states (for Illinois “Pike County – Unincorporated Areas” Map 170551 0075B, January 3, 1986, Zone A10).
- A statement that this portion of the Mississippi River is located in an area where a floodway has not been established (based on the Pike County, IL FEMA map panel).
- Discussion of the Illinois DNR standard for evaluation of flood impacts under the NFIP.
- Discussion of how the analysis of flood impacts for the various alternatives was performed. This discussion should cover whether the effective FEMA study hydraulic model was used to perform the analysis, or if not, how the analysis was performed, and why it was considered to be sufficient.
- A sensitivity analysis effects of the ice/debris barrier (if it is to be retained) with various degrees of blockage on the FEMA effective 1% annual chance flood elevations.

Final Panel Comment 9:

The performance indicators provided in Chapter 3 of the NESP PIR are not sufficiently detailed to screen out alternatives.

Basis for Comment:

The process used to screen out the less viable alternatives is not clearly presented in Chapter 3 of the NESP PIR.

The connection between the NESP PIR Sections 3.1, 3.2 and 3.3 text, and Table 3-1 and Table 3-2 is not clear. If the seven applicable ecosystem objectives of the 43 defined by the NESP Science Panel are used as the starting point, then they should be listed (and identified by number) in the first column of Table 3-1. The site specific objectives should be listed opposite the seven applicable ecosystem objectives. The units of measure provided in Table 3-2 are far too detailed for screening of alternatives. The Fish Passage Connectivity Index (FPCI) seems to include the measureable benefits (chance of encountering the fishway entrance, potential for fish to use the fishway, and duration of availability). These criteria should at least be mentioned in Table 3-2.

The following concerns also exist:

- Given the significant loss of rock and gravel riffle habitat (33 miles) in the Upper Mississippi River system, it seems questionable that the provision of a 200-foot wide fish passage would provide any significant benefit. The analysis that leads to the screening out of less feasible alternatives could be improved by focusing more on opportunities that could improve the longitudinal connectivity for a greater portion of time for the most species of fish.
- Section 3.2 provides a discussion of constraints. It would be useful to note in this section that any alternative that does not fall within these constraints, regardless of the aquatic habitat benefits it provides, would not be feasible and would be discarded from further consideration (e.g., dam removal).
- Section 3.1.2 provides a discussion of opportunities. It would be useful to note in this section that any alternative that does not provide a sufficient degree of success in achieving the opportunity will be discarded from further consideration.
- It is not clear that fish lockage would pass screening criteria, and it is not clear whether this alternative is viable if the 1200-foot lock is not constructed. The comment offered in the text (pg. 6-1) (“..... was retained only because it is technically feasible and recommended by the NESP Science Panel and stakeholders.”) in support of fish lockage is not sufficient to move this measure to the final group of alternatives that are evaluated in detail in Chapter 6. Having a pass/fail screening criteria would help clarify whether this alternative has enough merit to be carried forward.
- The discussion on technical fishways (pg. 6-1) should indicate that the slot pass fishway was the only measure selected for alternative evaluation and the “minimum standard of the project criteria” is not defined.

The alternatives screening process should include pass/fail criteria that all viable alternatives must meet, before they can be evaluated in detail in Chapter 6 using the product of FPCI and habitat units. The panel has determined that the following were used as pass/fail criteria:

- Adversely effects navigation.
- Adversely effects flooding.
- Suitably located to provide adequate fish attraction.
- Capable of passing a wide range of fish species.
- Capable of providing at least a minimum increase in aquatic habitat connectivity.

Using these and perhaps other pass/fail criteria, alternatives such as dam removal or fish stocking can be quickly eliminated from consideration. Although the measures selected for detailed evaluation in Chapter 6 appear to be the most viable, the combination of performance measures in Chapter 3 and the screening evaluation in Chapter 5 (Tables 5-2 and 5-3) are not sufficient and are not sufficiently explained.

Significance – Medium:

The lack of clear reasoning for removing alternatives from further and more detailed evaluation affects the completeness and understanding of the project.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- Improved connection between Tables 3-1 and 3-2, and Chapter 5 alternative screening.
- Provision of pass/fail criteria, such as those cited above, that could be used to explain why some alternatives were not evaluated in more detail in Chapter 6.
- Deciding on the most important screening criteria to use (e.g., Is providing a small area of gravel substrate a significant enough benefit to even consider using it as a screening criterion when the final alternative selection does not include it as a factor?) and documenting why the screening criteria are important.

Final Panel Comment 10:

The benefit of the permanent ice and debris barrier has not been justified relative to its cost.

Basis for Comment:

The purpose of the fixed debris boom is stated in Section 7.2.5 (Ch. 7, pg. 4) of the NESP PIR is to “minimize maintenance, deflect debris and ice towards the dam gates, and not impact the floodplain or navigation.” The debris boom estimated cost is shown in Table 7-6 as \$3M of the \$47 Total Project Cost. Based on the following factors, the panel does not believe that a permanent ice or debris barrier can be assumed is a necessity for the recommended fish passage alternative.

As described in common hydroelectric references such as *Civil Engineering Guidelines for Planning and Designing Hydroelectric Development* (ASCE, 1989) debris and ice booms are commonly used upstream of hydroelectric and water intakes. This is because these facilities have equipment with small openings that if blocked by collected debris or ice prevent the equipment from properly functioning. For example, as described in *Guidelines for Design of Intakes for Hydroelectric Plants* (ASCE, 1995) hydroelectric turbines typically have wicket gate and runner openings of less than 4 to 5 inches which, if blocked, will either disturb the operation and/or damage the turbine. Conversely, large spillway and dam opening such as gates do not typically have barriers since ice and debris will flow through and not disrupt operation or damage the gate.

While technical fish passages such as fish ladder or elevators have similar hydraulic openings as water intakes, the proposed fish passage is very different. As shown in Plate S19 of the NESP PIR, the proposed fish passage has 22 ft wide openings under the CON/SPAN bridge. This is as wide as many spillway gates, and therefore should not block or collect significant water borne material. Downstream of the CON/SPAN bridge, the proposed fish passage is 200 ft wide at the bottom with sloping sides. Plate C14 shows the fish passage boulders with minimum 4 ft clear openings protruding 4 ft above the ramp sill. This is a relatively large and low opening and should allow all except the largest debris, such as full sized trees and large sheet ice, to pass unimpeded through the fishway. Other considerations are:

- The random collection of large material should not impede the biological function of the fish passage. This collection would actually mimic the river’s natural characteristics and by providing additional pools and riffles might actually enhance upstream fish passage. Any natural debris collecting in the fish passage would aesthetically compliment a nature like appearance.
- If disruptive movement of the boulder pattern is anticipated to be a problem, it might be cost effectively mitigated by mechanically stabilizing selected boulders with provisions such as deadman anchors.
- Because the CON/SPAN bridge will have upstream stoplogs, if necessary, these could be installed during periodic or occasional extreme debris events that would potentially cause fish passage damage. For example, it is expected that there is little biological need for upstream fish movement during the annual spring freshet. Therefore, the stoplogs could be in place when large sheet ice would potentially pass through the site.

<p>To reduce installation labor costs, perhaps only partial stoplog placement would be needed to restrict debris concentrations to non-damage levels.</p> <ul style="list-style-type: none"> ▪ Eliminating the fixed debris boom should not affect the design or cost of the CON/SPAN bridge since the bridge stoplogs will already require the bridge to be designed for full height unequal hydrostatic pressures. These pressure reactions are much larger and structurally critical than debris or ice impact loads.
Significance – Medium:
The ice and debris barrier discussion lacks detail to determine its overall design and cost effectiveness.
Recommendations for Resolution:
<p>To resolve these concerns, the report would need to be expanded to include:</p> <ul style="list-style-type: none"> ▪ A comprehensive description of the types, durations, and frequencies of debris and ice events at this site. ▪ An evaluation of the potential impacts of debris on the fish passage large boulder placement by using the fish passage water levels and velocities during the previously identified debris events to determine the boulder impact forces and frequencies. ▪ If disruptive large boulder movement appears to be a fishway problem, an evaluation of the feasibility of potential mitigations such as stoplog installation and/or deeper boulder embedment and/or mechanical stabilization. This evaluation would include comparing the total life cycle costs between higher initial boulder stabilization costs versus higher periodic maintenance of less robust mechanically stabilized boulders.

Literature cited:

- American Society of Civil Engineers (ASCE). 1989. *Civil engineering guidelines for planning and designing hydroelectric developments*.
- American Society of Civil Engineers (ASCE). 1995. *Guidelines for Design of Intakes for Hydroelectric Plants*

Final Panel Comment 11:
In addition to low flow, the potential for fish to encounter the fish passage entrance must be evaluated under a range of flow conditions.
Basis for Comment:
<p>The analysis should be expanded to evaluate the potential for fish to encounter the fishway entrance under seasonal conditions reflecting project tailwater and fishway entrance hydraulics occurring during the spring fish migration period. The Estimate of Potential for Fish to Encounter the Fishway Entrance equation (Section 6.2.1, pg. 3-5) appears to be based only on a low-flow scenario. The ability of fish to find and enter the fishway entrance requires additional analysis at flows other than low flow, as the hydraulics affecting the ability of fish to locate and enter the fishway entrance can be different at higher flows. Most fish will migrate in the spring when river flows are high rather than low (Robison and Buchanan, 1988), fishway entrance attraction can be affected by the flow field hydraulics below the dam and at the fishway entrance, and these can vary depending on gate settings and the volume of flow competing with and masking fishway entrance flows. Tailwater and fishway entrance vicinity depth, turbulence and velocities can vary depending on seasonal differences in river flow and dam operations. The analysis should provide a typical high flow scenario based on flows prevailing at the dam during the months and seasons at which fish are expected to attempt to migrate (such as April) in accordance with information in Appendix A.</p>
Significance – Medium:
The lack of sufficient detail on the potential for fish to encounter the fishway passage entrance under a range of flow conditions affects the completeness and understanding of the project.
Recommendations for Resolution:
<p>To resolve these concerns, the NESP PIR would need to be expanded to include:</p> <ul style="list-style-type: none"> ▪ An analysis in which variable “Fs” (the size of fishway relative to the discharge in the river in the fishway equation in section 6.2.1) (Ch. 6, pg. 4) is related to high flow conditions that may occur during April rather than low flow. ▪ The use of high flow scenarios based on hydrologic data (Appendix H) related to specific months of the year during which targeted fish species are anticipated to migrate at this site. ▪ An expanded discussion in Section 6.2.1 to account for higher flow scenarios

Literature cited:

Robison, H.W. and T.M. Buchanan. 1988. Fishes of Arkansas. Univ. of Arkansas Press. Fayetteville, AR. 536 pp.

Final Panel Comment 12:
The rationale for the riffle habitat restoration does not include supporting hydraulic and substrate data.
Basis for Comment:
The NESP PIR does not include analyses to either substantiate or quantify the following statements contained in Chapter 4: "...nature-like fishways provide year round habitat for fish and macroinvertebrates adapted to higher gradient river conditions. Rock riffles may provide important spawning habitat for a number of native species including lake sturgeon". The fish passage "... would provide rapids habitat for macroinvertebrates, resident fishes and for fish spawning;" (Table 5-2). It cannot be assumed that the hydraulics (depth and velocity conditions) required to facilitate fish migration will meet microhabitat (depth and velocity) requirements for aquatic fauna to reside in the fish passage. Thus, it is not possible to evaluate the ecological value of the habitat suitability attributes of the proposed alternative and evaluate this parameter among the various fish passage alternatives. However, such an analysis could be accomplished because fish passage substrate and hydraulic (depth and velocity) characteristics appear to have been developed within Appendix H. Habitat suitability can be quantitatively evaluated by relating localized prevailing instream substrate, depth and velocity characteristics to habitat criteria (such as published Habitat Suitability Indices) for any specific species and life stages (Bovee, et al. 1998).
Significance – Medium:
The stated riffle habitat creation benefit of the chosen alternative requires further analysis of hydraulic data to verify proposed channel depth and velocity are suitable for aquatic fauna.
Recommendations for Resolution:
<p>To resolve these concerns, the report would need to be revised to include:</p> <ul style="list-style-type: none"> ▪ More detailed analysis to include relating hydraulic data of each fish passage alternative (Appendix H) to available published habitat suitability criteria for specific species and life stages of aquatic organisms believed to benefit from riffle habitat, or ▪ Literature citations of examples of fish passage habitat creation from other projects, or an omission of unsubstantiated references to riffle habitat benefits of these alternatives.

Literature cited:

Bovee, K.D., B.L. Lamb, J.M. Bartholow, C.B. Stalnaker, J. Taylor and J. Henriksen. 1998. Stream habitat analysis using the instream flow incremental methodology. U.S. Geological Survey, Biological Resources Division Information and Technology Report USGS/BRD-1998-0004/ viii + 131 pp.

Final Panel Comment 13:

Some fish species are incorrectly classified as migratory which may potentially overestimate the benefits to non-migratory fish species.

Basis for Comment:

Some of the project benefits are unclear because distinctions between obligatory migrating species populations and those species where only individuals make localized movements are unclear. Chapters 2 and 6 of the NESP PIR list a number of species as “migratory.” By definition, migrations are mass movements that result in major shifts in the location of a population between at least two environments as a regular part of the life cycle (Moyle and Cech, 2004). In Chapter 2 of the NESP PIR, the text states, “Some fish species exhibit regular migration behavior, homing to specific locations year after year (Pitlo 1989, Osborn and Schupp 1985)” (Ch. 2, pg. 10). Although this statement seems reasonable, the subsequent statement, “We should assume that they are migratory unless proven otherwise. The proof of the latter assumption is that most fishes of the UMR previously migrated and colonized a geographically large river system” (Ch. 2, pg. 10) only offers an assumption based on colonization, which could have easily resulted from territorial exploration of individuals, or transplanting, rather than mass-migration.

Although many species listed in NESP PIR Chapter 6 (Table 6-1) do meet the definition of migratory, at least some species listed do not typically exhibit migratory behavior, including largemouth bass, smallmouth bass, longnose gar, bigmouth and smallmouth buffalo, and yellow bass. Localized, short-distance nearshore to channel area movements are individual movements and not migrations. Nor does random exploration or foraging movements of individuals constitute migration. Species such as largemouth bass and smallmouth bass are very cover-oriented and tend to remain in localized areas for their entire life spans, although some individuals may relocate or make localized movements to explore foraging or seek wintering areas. In addition to promoting restoration of true migratory species, the fish passage may also collaterally benefit individuals by improving habitat connectivity and facilitating localized movements.

Significance – Medium:

Broadly classifying species as “migratory” may potentially overstate the benefits of this project including the Fish Passage Connectivity Index (FPCI).

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

- A clear definition of “migratory” for the purposes of this project.
- The elimination of species not meeting the definition of migratory from Table 6.1. They should also not be included in the FPCI or adaptive management assessments.
- A separate category for non-migratory species that may experience sub-population collateral benefits due to improved habitat connectivity. These species should not be evaluated using the FPCI

Literature cited:

- Moyle, P.B. and J.J. Cech, Jr. 2004. Fishes – an introduction to ichthyology – 5th edition. Prentice-Hall, Upper Saddle River, NJ.726 pp.
- Stone, U.B., D.G. Pasko, and R.M. Rucker. 1954. A study of Lake Ontario-St. Lawrence River smallmouth bass. New York Fish and Game Jour. 1:1. pp.1-28.

Final Panel Comment 14:
The discussion on American eel is misleading and the discussion on Asian carp needs to be balanced to include other invasive species.
Basis for Comment:
<p>The NESP PIR (Ch. 2 (p.22) erroneously states that “..the American eel...may decline in abundance to the point where they may be listed as endangered..” The United States Fish and Wildlife Service (USFWS) recently rejected a petition to list the American eel as endangered (Federal Register / Vol. 72, No. 22 / Friday, February 2, 2007 / Proposed Rules 4967). American eel aggregations in any given river may opportunistically explore upstream habitat, but are not an upstream migrant population that is obligated to ascend upstream past any certain point in order to complete its life cycle. According to the USFWS (2007), “ ‘Facultative Catadromy’ is the term used for this species unique life history. American eel .. larvae are transported by ocean currents to the Atlantic coast ...The larvae enter coastal waters where they may stay, or ... move into estuarine waters or migrate up freshwater rivers”. Juvenile American eel in any given river may explore upstream habitat but are not necessarily obligatory upstream migrants depending on suitable habitat locations, proximity to the sea, and population density. Many juvenile eels exhibit facultative catadromy, moving upstream and then back downstream, often between saltwater and freshwater environments (Aoyama, 2009). Once juvenile eels have selected a location to “reside” they often exhibit a limited home range, largely occupying that home range until they mature and migrate downstream on their spawning run.” Linking fish passage at NESP PIR with the health of the American eel population therefore incorrectly implies that fish passage at the project is strategic to American eel population health.</p> <p>The NESP PIR does not discuss why the Asian carp is singled out as an invasive (i.e., non-indigenous) species that poses a greater threat to ecosystem integrity than other equally non-indigenous species. All such non-indigenous species may potentially impair ecosystem recovery. According to Wilcox, et al. (2004) , “Nonindgenous species can affect fish and aquatic community diversity through an outright loss or displacement of native species. Once established, they may be able to out-compete native species, or modify their habitat. ...For example UMR exotic species such as the grass carp and common carp destroy aquatic vegetation, increase water turbidity, and can reduce, degrade or eliminate certain types of valuable fish and wildlife habitat”. In several places in Chapters 2 and 3 (Ch. 2 pg. 23, Ch. 3, pg. 3-5), Asian carp is discussed as an invasive species threat without mentioning the comparable impacts of other invasive species (common carp, grass carp, goldfish, round goby, as well as introduced species - striped bass, striped bass/white bass hybrids, and trout), or alternatively, explaining why there is heightened concern about this particular species. Linking all invasive impacts to a single fish species risks potentially understating similar impacts emanating from other invasive species affected by fish passage at this site, or result in overstating impacts due solely to the Asian carp.</p>
Significance – Medium
An accurate and complete description of the project’s impact on the American eel and Asian carp needs to be included in the NESP PIR.

Recommendations for Resolution:

To resolve these concerns, the report would need to be edited to include:

- A modification of the discussion of American eel to state that failure to improve fish passage for the NESP PIR may potentially inhibit localized abundance of American eel, rather than imply that failure to provide fish passage could lead to endangerment of the species.
- An expansion of the discussion of invasive species to account for (or alternatively discount) the ecological impacts of invasive species other than Asian carp, or else more thoroughly discuss ecological concerns regarding Asian carp to help clarify why this species is a unique threat to the ecosystem

Literature cited:

USFWS 2007. American Eel Questions and Answers, Endangered Species Act 12-Month Petition Finding U.S. Fish and Wildlife Service.

Aoyama, J. 2009. Life history and migration in catadromous eels. *Aqua-BioSci. Monogr* 2:1, pp. 1-42.

Wilcox, D.B., E. L. Stefanik, D. E. Kelner, M. A. Cornish, D. J. Johnson, I.J. Hodgins, S. J. Zigler, and B.L. Johnson. 2004. Improving fish passage through navigation dams on the Upper Mississippi River system. Interim report. U.S. Army Engineer District, Rock Island Rock Island, IL , U.S. Army Engineer District, St. Louis, MO U.S. Army Engineer District, St. Paul MN 111 pp. plus appendices.

Final Panel Comment 15:
It is not clear if there will be changes in sediment transport conditions and if the changes will impact the aquatic habitat.
Basis for Comment:
The NESP PIR (Ch. 2, pg. 10, Sedimentation), does not address the sedimentation issues as they pertain to the proposed fish passage project. Section 2.10 (pg. 2-21) provides general statements about backwater and secondary channel sedimentation (e.g., “Fine sediments flow with river currents to backwaters and slackwater areas where they drop out of suspension.”), and indicates that aquatic habitat would be improved by reducing fine sediment inputs to these areas, and that other NESP projects “...will improve fisheries habitat in 33 backwaters, 29 secondary channels and 19 wing dam/dikes”. However, this section should discuss the need to evaluate the alternatives for this project in terms of sedimentation.
Significance – Low:
The technical quality if the report would be improved with the discussion of sediment transport conditions and the potential impact on sedimentation and the existing aquatic habitat.
Recommendations for Resolution:
<p>To resolve these concerns, the report would need to be expanded to include:</p> <ul style="list-style-type: none"> ▪ Discussion of the existing bed and suspended sediment loads and conditions from available information. ▪ Discussion of the potential for the addition of fish passage to alter the existing sediment transport conditions upstream and downstream of the proposed fish passage feature. ▪ The expansion of this section could be performed using existing available resources and would not need to include sediment transport analysis.

Final Panel Comment 16:
Specific biological goals relating to the project performance, including fishery management objectives, should be included in the fisheries discussion.
Basis for Comment:
The panel believes that measurable biological goals set by management plans are not fully discussed. The Fisheries Resources discussion (Ch. 2, p. 10) of the NESP PIR does not reference any specific management goals for the resource such as institutionalized state or federal management or recovery plans that may already exist. Such plans could provide measurable indices of project success. For example, publically-vetted goals that typically appear in management plans relevant to a project similar to the NESP PIR might be to “increase the abundance and diversity of native fish species in the upper and middle Mississippi River”, or “enhance self-sustaining populations of commercially valuable/ recreationally important/ endangered species”, or “double the standing crop of channel catfish”. Inclusion of any such goals would enable the public and the project managers to evaluate if the project performance resulted in successfully restoring fishery resources.
Significance – Low:
Agency management plans would provide measureable objectives to better substantiate the project and/or provide goals and metrics by which to evaluate project success.
Recommendations for Resolution:
<p>To resolve these concerns, the report would need to be expanded to include:</p> <ul style="list-style-type: none"> ▪ Direct reference to any relevant state or federal fishery management plans or objectives for this segment of the Mississippi River that would benefit from the improvements in the fish passage. ▪ Tabular or narrative information summarizing any applicable measureable, quantitative goals for fish resource recovery obtained from state or federal agency management/recovery plans.

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APPENDIX B

Final Charge to the Independent External Peer Review Panel

on the

NESP Project Implementation Report

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APPENDIX B
Final Charge Guidance and Questions to the Panel Members
for the Independent External Peer Review
of NESP Lock and Dam 22
Fish Passage Improvement Project Implementation Report

BACKGROUND

The Lock and Dam 22 Fish Passage Improvement Project Implementation Report (L/D 22 Fish Passage PIR) is part of the Navigation and Ecosystem Sustainability Program (NESP). The project is located near Saverton, Missouri about ten miles southeast of Hannibal, Missouri in Ralls County. Lock and Dam 22 is a part of the 9-foot navigation project. Though this dam serves to impound water for navigation, it also serves as an impediment to upstream fish movement. Restoring the connectivity for migratory fishes by allowing unrestricted passage over the dam through a fishway is necessary.

The purpose of the review document NESP L/D 22 Fish Passage PIR with integrated Supplemental Environmental Assessment (SEA) and appendices is to present the results of a feasibility study undertaken to restore connectivity of the Upper Mississippi River (UMR) for a wide range of migratory warmwater fish species. This report provides planning, engineering, and implementation details of the recommended restoration plan to allow final design and construction to proceed subsequent to the approval of the plan. Because of the importance of this project, an independent external peer review (IEPR) of the NESP L/D 22 Fish Passage Improvement PIR will be conducted. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

OBJECTIVES

The objective of this task is to conduct an Independent External Peer Review (IEPR) of the NESP L/D 22 Fish Passage PIR. The IEPR will follow the procedures described in the Department of the Army, U.S. Army Corps of Engineers' guidance *Peer Review of Decision Documents* (EC 1105-2-410), dated August 22, 2008, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review*, released December 16, 2004. The IEPR is one of the important procedures used to ensure the quality of published information meets the standards of the scientific and technical community.

The purpose of the IEPR is to analyze the adequacy and acceptability of economic, engineering and environmental methods, models, data and analyses performed for the NESP Lock and Dam 22 Fish Passage Project Implementation Report and Supplemental Environmental Assessment. The independent review will be limited to technical review and will not involve policy review. The peer review will be conducted by panel members with extensive experience in engineering, economic, and environmental issues associated with large river systems and restoration.

The panel members will be "charged" with responding to specific technical questions as well as providing a broad technical (engineering, economic, and environmental) evaluation of the overall project. The panel members will identify, recommend, and comment upon the assumptions underlying the analyses as well as evaluating the soundness of models and planning methods. The panel members should be able to evaluate whether the interpretations of analyses and

conclusions are technically sound and reasonable provides effective review in terms of both usefulness of results and of credibility, and have the flexibility to bring important issues to the attention of decision makers. The panel members may offer opinions as to whether there are sufficient technical analyses upon which to base the project implementation. The panel members will address factual inputs, data, the use of geotechnical, hydrologic, and hydraulic models, analyses, assumptions, and other scientific and engineering tools/methodologies to inform decision-making.

DOCUMENTS PROVIDED

The following is a list of documents and reference materials that will be provided for the review. **The documents and files presented in bold font are those which are to be reviewed.** All other documents are provided for reference.

- **Navigation and Ecosystem Sustainability Program, Project P2, Lock and Dam 22 Fish Passage Improvement Project Implementation Report and associated Appendices A-Q**
- Fish Passage Connectivity Index, Planning Model Developed for Upper Mississippi River System Navigation and Ecosystem Sustainability Program, Lock and Dam 22 Fish Passage Improvements Ecosystem Restoration Project (Model Documentation)
- Potential Fish Passage Effectiveness Model, Upper Mississippi River System Navigation and Ecosystem Sustainability Program, Lock and Dam 22 Fish Passage Improvements Ecosystem Restoration Project (Model Review Report)
- Wilcox, D.B., E.L. Stefanik, D.E. Kelner, M.A. Cornish, D.J. Johnson, I.J. Hodgins, S.J. Zigler, and B.L. Johnson. 2004. Improving fish passage through navigation dams on the Upper Mississippi River System. Upper Mississippi-Illinois Waterway Navigation Study ENV Report 54. Rock Island District, U.S. Army Corps of Engineers, Rock Island, IL. 110 pp. + Appendices.
([http://www2.mvr.usace.army.mil/UMRS/NESP/Documents/Cover\(ENV54\).pdf](http://www2.mvr.usace.army.mil/UMRS/NESP/Documents/Cover(ENV54).pdf))
- Final Upper Mississippi River Illinois Waterway System Navigation Feasibility Study Integrated Feasibility Report and PEIS dated 24 September 2004
([http://www2.mvr.usace.army.mil/UMRS/NESP/Documents/Final_FES_EIS_Report_Cover\(2004\).pdf](http://www2.mvr.usace.army.mil/UMRS/NESP/Documents/Final_FES_EIS_Report_Cover(2004).pdf))
- USACE guidance *Peer Review of Decision Documents* (EC 1105-2-410) dated August 22, 2008;
- CECW-CP Memorandum dated March 31, 2007; and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

SCHEDULE.

IEPR Task	Activity	Projected Date
5	Kick-off Meeting	October 9, 2009
6	Review documents and charge sent to panel members	October 9, 2009
	Panel members complete their review and provide comments to Battelle	November 6, 2009
	Battelle provides panel members merged comments and talking points for panel review teleconference	November 16, 2009
	Convene panel review teleconference	November 19, 2009
	Battelle provides Final Panel Comment directive to panel	November 20, 2009
	Panel members provide Final Panel Comments to Battelle	November 30, 2009
	Battelle provides feedback to panel members on final panel comments/panel provides revised final panel comments per Battelle feedback	November 30 - December 2, 2009
7	Panel provides comments on Final IEPR Report	December 10, 2009
	Battelle submits Final IEPR Report to USACE	December 17, 2009
8	Battelle inputs Final Panel Comments to DrChecks	December 21, 2009
	Battelle provides Draft Evaluator Responses from USACE to panel via e-mail (Word document)	January 11, 2010
	Panel members provides Battelle with draft BackCheck responses	January 14, 2010
	Teleconference with Battelle and panel members to discuss panel's draft response to draft Evaluator comments	January 14, 2010
	Teleconference with Battelle, IEPR Panel, and USACE to discuss Final Panel Comments and USACE clarifying questions	January 15, 2010 (pending panel availability)
	USACE inputs Final Evaluator responses to Final Comments in DrChecks (Battelle distributes Final Evaluator responses to panel)	February 5, 2010
	IEPR Panel sends Battelle their BackCheck responses to USACE Evaluator Responses	February 18, 2010
	Battelle posts final IEPR panel input to DrChecks; Submits pdf of DrChecks file to USACE; Closeout of DrChecks	March 1, 2010

CHARGE FOR PEER REVIEW

As part of the IEPR review, panel members are asked to determine whether the technical approach and scientific rationale presented in the NESP Lock and Dam 22 Fish Passage Improvement PIR are credible and whether the conclusions are valid. The panel members are asked to determine whether the technical work is adequate, competently performed, properly documented, satisfies established quality requirements, and yields scientifically credible conclusions. The panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions relating to the IEPR review, are listed by report section, Annex, or Appendix, are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the NESP L/D 22 Fish Passage PIR. Please focus on your areas of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance. Note that the panel will be asked to provide an overall statement related to 1 and 2 below per USACE guidance (EC 1105-2-410; Appendix D).

1. Assess the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analysis used.
2. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation for construction, authorization, or funding.
3. Identify, explain, and comment on assumptions that underlie economic, engineering, ecological, hydrological, plan formulation, or environmental analyses.
4. Evaluate whether the interpretations of analysis and conclusions are reasonable.
5. Please focus the review on scientific information, including factual inputs, data, the use and soundness of models, analyses, assumptions, and other scientific and engineering matters that inform decision makers.
6. Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also please **do not** comment on or make recommendations on policy issues and decision making.

If desired, panel members can contact one other. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Independent Technical Review.

Please contact the Battelle Deputy Project Manager (Lauren Baker-Hart, bakerhartl@battelle.org) or Project Manager (Karen Johnson-Young, johnson-youngk@battelle.org) for requests or additional information.

In case of media contact, notify the Battelle Project Manager immediately.

Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

Please submit your written comments in electronic form to Lauren Baker-Hart, bakerhartl@battelle.org, no later than November 4, 2009, 10 pm EDT.

NESP Lock and Dam 22 Fish Passage Improvement Project Implementation Report Independent External Peer Review

Final Charge Questions

GENERAL QUESTIONS

1. Are the assumptions that underlie the economic, engineering and environmental analyses sound?
2. Comment on the adequacy and acceptability of the economic, engineering, and environmental methods, models and analyses used.
3. In general terms, are the planning methods sound?
4. Are the interpretations of analysis and conclusions based on the analysis reasonable?
5. Have all NEPA requirements been met in this report?
6. Does the project impact or increase the likelihood of scour?
7. Does this project provide adequate systems benefits if constructed?
 - a. What if no other similar projects are constructed?
8. The 2008 Screening for Portfolio Risk Analysis (SPRA) report for Lock and Dam 22 lists 5 potential modes of failure (PMF) for the dam. Will the project either during or after construction negatively impact these possible failure mechanisms (a through e below)?
 - a. Erosion – Toe, surface, crest of overflow section and storage yard area (non-overflow structure).
 - b. The overflow section can fail due to internal erosion of foundation soil caused by excessive seepage gradients.
 - c. The spillway gates are not designed for trunnion friction which could break framing members and fail gate when operated during normal pools.
 - d. Lock monolith could overturn from normal, seismic or at rest soil pressure loads.
 - e. Structural Failure of auxiliary lock gates resulting in loss of navigation pool.
9. Assess the adequacy of assumptions, methods, and models used to ensure strength and stability of the existing dam features during construction and in the final configuration of the fish passage structure. This includes but is not limited to

affected structures and foundations and performance metrics of sliding, overturning, seepage and slope stability.

10. Assess the adequacy of assumptions, methods, and models used to ensure strength and stability of the new damming features of the fish passage structure during construction and in the final configuration of the fish passage structure. This includes but is not limited to affected structures and foundations and performance metrics of sliding, overturning, seepage and slope stability.
11. Assess models, methods, and conclusions contributing to the decree that the fish passage structure and its operation will not adversely impact navigation. This includes all navigation at all times the lock and river are navigable.
12. Assess models, methods, and conclusions that neither adverse/unacceptable scour nor sedimentation patterns/results will occur. Scour includes but is not limited to impacts on upstream and downstream riverbed, structures, islands, bank lines, and the fish passage structure features.
13. Assess the reasonableness of assumptions of means and methods of constructing the fish passage structure such as consideration of the elements/environment, the presence of the dam and turbulent release, the staging of materials, the management of workers, etc. and that these assumptions are adequately reflected in the engineering cost estimate.
14. Assess that engineering data collection, use, and interpretation is adequately considered for the level of the report and design. Also, where additional engineering data is beyond the level of this report that there is recognition in the report of such data needs. Engineering data includes, but is not limited to:
 - a. Study of past performance such as contained in periodic inspection reports and dam safety documentation in the Rock Island District.
 - b. Surveys including ground surveys, aerials, and bathymetry.
 - c. Condition assessment of existing features and adequacy to perform consistent with strength and stability calculations. This could include erosion and corrosion of steel or concrete features, foundation elements, settlement or bulging of sheet pile cells, etc.
 - d. Geotechnical parameters for in-situ and fill materials, foundations, seepage, material strength and stability.

SECTION 1.0 – INTRODUCTION

1.1. Summary of Location, Habitat Problems, and Opportunities

No questions

1.2. Purpose of Report and Scope

15. Is the purpose of the report clearly stated and is the purpose met?

16. Are the project goals and objectives clearly identified in the report?
17. According to this section of the report, costs and benefits of the restoration alternatives are identified and the alternative plans are compared. Does the study sufficiently take into account potentially negative impacts?
18. The report is intended to “demonstrate that the selected plan is cost effective and justify the desired level of outputs.” Is the basis for determining the desired level of outputs explained in the report?
 - a. Are they adequately described and quantified?
19. Are the performance measures in the monitoring plan consistent with the identified target goals?
20. Have all the unique project features and site-specific characteristics that were not addressed in the PEIS been considered in the SEA?

1.3. Project Authority

21. Does the PIR cost-effectively meet the WRDA goal to attain and maintain the sustainability of the Upper Mississippi River (UMR) ecosystem?
22. How effectively does the long-term monitoring contribute to determining the trends in ecosystem health, understanding systemic changes, and helping identify restoration needs?
23. Please comment on the ecosystem goals and specific performance measures designed to demonstrate ecosystem restoration.
24. Are the target goals for each performance indicator well described and reasonable? If not, explain.

1.4. 12 Actions for Change

25. Have the Corps’ 12 Actions for Change been addressed by the proposed NESP L/D 22 Fish Passage PIR Project?

1.5. Project Selection – Prioritization Process

No questions

1.6. Program-wide Ecosystem Objectives

26. Does the project, when implemented, achieve the program-wide ecosystem objectives? Why or why not?

1.7. Resource Significance

27. Please comment on the comprehensiveness and accuracy of the discussions of the Upper Mississippi River (UMR) Basin’s institutional, public, and biological significance.

1.8. The Significance of Migratory Fish Populations in the UMRS and the Importance of Habitat Connectivity

- 28. Please comment on the comprehensiveness and accuracy of the discussion of migratory fish populations' significance in the Upper Mississippi River Basin.
- 29. Please comment on the comprehensiveness and accuracy of the discussion of habitat connectivity and the benefits of fish passages.

1.9. Discussion of Prior Studies, Reports, and Existing Water Projects

No questions

SECTION 2.0 – ASSESSMENT OF EXISTING RESOURCES AND FUTURE WITHOUT CONDITIONS

2.1. General Characteristics of the Upper Mississippi River Ecosystem

- 30. Please comment on the comprehensiveness and accuracy of the general Upper Mississippi River Basin characteristics discussion.

2.2. Resource History

No questions

2.3 Land Use and Infrastructure

No questions

2.4. Habitat Availability

- 31. Are the coverage acreages provided for the habitat availability discussion accurate?

2.5. Freshwater Mussel Resources

- 32. Please comment on the comprehensiveness and accuracy of the freshwater mussel resources discussion.

2.6. Fishery Resources

- 33. To what degree can success of the project based on anecdotal information be assured, given that scientific knowledge of the locations of successful spawning aggregations is unknown?
- 34. Please comment on the comprehensiveness and accuracy of the fisheries discussion.
- 35. Please comment on the assumption made in this section that Upper Mississippi River fish are migratory unless proven otherwise.

2.7. Endangered Species

36. Please comment on the comprehensiveness and accuracy of the endangered species discussion.

2.8. Tributaries

37. Please comment on the comprehensiveness and accuracy of the tributaries discussion.

2.9. Historic and Cultural Resources

No questions

2.10. Sedimentation

38. Comment on the thoroughness and accuracy of the information presented on the existing conditions and processes related to sedimentation.
39. Comment on whether the sedimentation discussion is sufficient to allow for an evaluation of the effects of implementation of the proposed plan compared to current baseline conditions.
40. Comment on whether the sedimentation discussion is sufficient to allow for an evaluation of the future without conditions.

2.11. Hazardous, Toxic, and Radioactive Waste (HTRW)

41. To what extent have sufficient studies been performed to rule out the possibility that “recognized environmental conditions” might interfere or delay implementation of the project?
42. To what extent are HTRW issues a concern for this project?

2.12. Future Without Conditions

43. Please comment on the use of the Fish Passage Connectivity Index for measuring the “future without project” conditions.
44. Please comment on the determination that “future without project” conditions resulted in zero average annual habitat units to fish passage.
45. Please comment on the “future without project” conditions for fisheries, mussels, and water quality.

SECTION 3.0 – PROJECT GOALS AND OBJECTIVES

3.1. Problems and Opportunities

46. Have all potential problems and opportunities been identified?
 - a. Are there other known problems and opportunities that should be considered?

47. Please comment on whether the list of problems affecting fish passage at Lock and Dam 22 is comprehensive.
48. Please comment on whether the descriptions of the problems affecting fish passage at Lock and Dam 22 are accurate.
49. Please comment on the comprehensiveness of the list of opportunities that may arise from the execution of the project.

3.2. Constraints and Assumptions

50. Comment on whether the project constraints are adequately characterized.

3.3. Project Goals and Objectives

No questions

3.4. Potential Performance Indicators

51. To what extent do the performance indicators meet the requirements to establish specific measurable outcomes?
52. Comment on whether the Potential Performance Indicators are adequate for assessing the site-specific criteria.

SECTION 4.0 – POTENTIAL MEASURES

53. Are the potential measures adequately described and illustrated. Why or why not?
 - a. What, if anything, is missing?
54. Is sufficient information provided to eliminate alternatives from further consideration?
 - a. If no, please explain.
55. Please comment on whether the measures retained for further consideration are supported.
 - a. Are there other measures that should have been considered?
 - b. If yes, please explain.

4.1. General

56. Please comment on the list of potential performance indicators and units of measurement. What, if anything, is missing?

4.2. Potential Measures and Increments

57. To what extent might factors such as reduced water quality from increased agriculture and expanding housing developments that have taken place since Lock and Dam 22 was constructed, limit the reestablishment of critical ecosystem species after project completion?

58. In your opinion, to what extent are prescriptive, quantitative thresholds needed to gauge the relative success of the project?
59. Are the accuracy and comprehensiveness of the discussion of Non-Structural Measures adequate? Why or why not?
60. Please comment on the need for an ice and debris boom upstream of the fish passage structure.
61. Please comment on the design criteria for the rock ramp fishway being considered for Lock and Dam 22.
62. Please comment on the various proposed locations for the rock ramp fishway being considered for Lock and Dam 22.
63. Please comment on the various sizes proposed for the rock ramp fishway being considered for Lock and Dam 22.
64. Please comment on the operation and maintenance discussion for the rock ramp fishway being considered for Lock and Dam 22.
65. Please comment on the types of technical fishways proposed for Lock and Dam 22.

SECTION 5.0 – ALTERNATIVE PLANS

66. Please comment on the extent to which the alternative plans and down-selection process are clearly presented.
67. Please comment on the extent to which the screening criteria are justified and consistently applied in the screening process.
68. Please comment on whether the presentation of alternative plans is understandable including table organization and numbering.

5.1. Project Measures

No questions

5.2. Project Alternatives

No questions

SECTION 6.0 – EVALUATION AND COMPARISON OF ALTERNATIVE PLANS

6.1. General

No questions

6.2. Ecosystem Benefit Analysis

69. Please comment on the clarity of the approach used to calculate habitat units in order to evaluate environmental benefits.
70. Please comment on the ecosystem benefit analysis and confirm that it appropriately followed the model. Were the inputs to this analysis appropriate? Why or why not?
71. Please comment on the application of the Fish Passage Connectivity Index to quantify ecosystem restoration benefits of the alternative plans.
72. Please comment on the discussion on estimating the potential for fish to encounter the fishway entrance.
73. Please comment on the discussion on estimating the potential for fish to use alternative fish passage measures.
74. Please comment on the discussion on estimating the duration of availability of the alternative measures.

6.3. Cost Analysis

- 75. Please comment on the extent to which the costs are consistent with and justified by the detailed analysis in Appendix C.

6.4. Management Measure Outputs and Costs

- 76. Please comment on the estimated construction and O&M costs associated with each proposed management measure.
- 77. Do the management measures provide a comprehensive set of features to help address the plan objectives? If not, explain.

6.5. Alternative Plan Evaluation and Comparison Factors

- 78. Please comment on the clarity of the approach used to determine cost effectiveness and incremental costs and benefits.
- 79. Please comment on the extent to which the results are supported by and consistent with the detailed analyses presented in the appendices.
- 80. Please comment on the procedures and criteria used to screen and evaluate listed project alternatives.
- 81. Please comment on the cost effectiveness/incremental cost analysis methodology and conclusions.
- 82. Please comment on the risk and uncertainty associated with the Lock and Dam 22 project.
- 83. Comment on whether the analysis adequately supports the results presented.

6.6. Selection of the Recommended Plan

- 84. Please comment on the estimated average annual habitat units expected to be produced due to implementation of the proposed project.
- 85. Please discuss whether the conclusions drawn on the viability of each alternative are supported by the analysis.
- 86. Does the recommended plan address the purpose and authority of the project as well as the problems, objectives, constraints, and criteria outlined for the project? If not, explain.
- 87. Please comment on the extent to which the selection of the recommended plan is clearly explained and supported by the analysis.

SECTION 7.0 – DESCRIPTION OF RECOMMENDED PLAN

7.1. Plan Components

88. Are the elements of the plan depicted clearly in the report relative to the existing structures and conditions? Why or why not?

7.2. Design Considerations

89. Are the geometric parameters conceived in the recommended plan optimal? Why or why not?
90. To what extent has vulnerability of the recommended plan to natural hazard events (floods, tornadoes, earthquakes) been assessed at the feasibility stage?
91. In your opinion, how susceptible will the recommended plan be to fouling, scouring, and degradation during normal flow and flood conditions?
- a. Does the recommended plan address these possible issues?
92. Do you agree with the determination not to incorporate slope stability instrumentation into the fish passage project and existing dike? If not, explain.
93. Is the quantity of anticipated construction techniques for Dam Safety appropriate? Why or why not?

7.3. Project Implementation Timeline

No questions

7.4. Construction Considerations

94. Are cost factors associated with availability of funds appropriately addressed to capture cost/funding required over long-term approach?

7.5. Lands, Easements, and Right-of-Way (LERS) Considerations

No questions

7.6. Operational and Maintenance (O&M) Considerations

No questions

7.7. Actions for Change Considerations

No questions

7.8. Cost Estimates

95. In your opinion, is sufficient geotechnical information currently available?
- a. What, if any, additional geotechnical studies be contemplated to contribute information needed in project planning and design?

SECTION 8.0 – ENVIRONMENTAL EFFECTS

8.1. Effects on Significant Resources in the Project Area

96. Please comment on the accuracy of the assessment that the proposed project will have on the significant resources in the project area.

8.2. Threatened and Endangered Species

97. Please comment on the accuracy of the assessment that the proposed project will not adversely affect any federally-listed endangered species.

8.3. Cultural Resources

98. Please comment on the accuracy and comprehensiveness of the potential impacts to cultural resources.

8.4. Effects on Socioeconomic Resources and Human Use

99. Please comment on the completeness of the discussion of the effects on socioeconomic resources and human use.
100. Please comment on the accuracy and comprehensiveness of the potential impacts to socioeconomic resources and human use.

8.5. Cumulative Effects

101. Please comment on the accuracy and comprehensiveness of the cumulative effects discussion.

8.6. Relationship of the Proposed Projects to Other Planning Efforts

102. Is the list of related planning efforts comprehensive? Why or why not?

8.7. Short-term Versus Long-term Productivity

No questions

8.8. Irretrievable Commitments of Resources

103. Please comment on whether the evaluation of the permanent and irreversible features of the proposed project was comprehensive.

8.9. Probable Adverse Environmental Impacts Which Cannot Be Avoided

104. Please comment on the accuracy and comprehensiveness of the list of probable unavoidable adverse environmental impacts.

8.10. Compliance with Environmental Quality Statutes

105. Please comment on the accuracy and comprehensiveness of the compliance with environmental quality statutes.

SECTION 9.0 – ADAPTIVE MANAGEMENT AND MONITORING

106. Are the adaptive management and monitoring studies that have been performed or are proposed sufficient for assuring that the project meets the desired objectives? Why or why not?

9.1. Authority

No questions

9.2. Origins of NESP Adaptive Management and Monitoring

No questions

9.3. Constraints of Adaptive Management and Monitoring

107. Please comment on the constraints identified for the Lock and Dam 22 project.

9.4. Adaptive Management and Monitoring Objectives and Implementation Schedule

108. Please comment on the adaptive management and monitoring objectives.

109. Please comment on the adaptive management and monitoring implementation schedule.

9.5. Evaluation and Reporting

No questions

9.6. Benefits of Adaptive Management and Monitoring

No questions

9.7. Description of Adaptive Management and Monitoring Studies

110. Please comment on the different adaptive management and monitoring studies described in this section.

111. Please comment on whether the studies described in this section are suitable and comprehensive enough to determine whether the project is successful.

SECTION 10.0 – IMPLEMENTATION RESPONSIBILITIES

10.1. U.S. Army Corps of Engineers

No questions

10.2. Non-Federal Sponsor

No questions

10.3. Real Estate Requirements

No questions

10.4. Views of Other Agencies Having Implementation Responsibilities

No questions

SECTION 11.0 – COORDINATION AND VIEWS

11.1. Federal Agencies

No questions

11.2. State Agencies

No questions

11.3. Native American Tribes

No questions

11.4. Public Involvement

No questions

11.5. Coordinating Parties

No questions

SECTION 12.0 – RECOMMENDATIONS

No questions

SECTION 13.0 – FINDING OF NO SIGNIFICANT IMPACT

123. Are the determinations made in the FONSI supported in the report?
 - a. Has anything of importance been omitted?

SECTION 14.0 - REFERENCES

No questions

SECTION 15.0 - ACRONYMS

No questions

APPENDIX A - PERTINENT CORRESPONDENCE

No questions.

APPENDIX B - CLEAN WATER ACT, SECTION 404(b)(1) EVALUATION

112. Please comment on the determinations made in the Clean Water Act Section 404(b)(1) evaluation.

APPENDIX C - COST ESTIMATE

113. Should further consideration be given to the escalation factor used to identify general cost impacts for the project? Why or why not?
114. Please comment on the use of the escalation factor for longer term frequency of O&M elements such as the 15-year frequency of the “O&M Stoplog Structure Replace Seals” and the 30-year “Stoplog Structure Sand Blast and Repaint,” and other 10-year and 15-year structures adequate to capture longer term costs.

APPENDIX D - FISH PASSAGE CONNECTIVITY INDEX

115. Please comment on the use and application of the Fish Passage Connectivity Index for this project, including the inputs and outputs.

APPENDIX E – INCREMENTAL COST ANALYSIS

116. Please comment on the extent to which the summary in Table E5 is consistent with and justified by the analyses included in the PIR and appendices.

- 117. Please comment on the extent to which the Best Buy Alternatives are explained and the data is sufficient to justify the recommended plan.
- 118. Please comment on the accuracy and comprehensiveness of the detailed incremental cost analysis.
- 119. Please comment on the accuracy of the data presented in Figure E-1: Review Figure E-1.

APPENDIX F – GRAIN SIZE AND ELUTRIATE ANALYSIS RESULTS

- 120. Comment on the adequacy and conclusions of the grain size and elutriate analysis results.
- 121. In your professional opinion, are there sufficient existing data?
 - a. If not, what additional studies might be contemplated?

APPENDIX G – GEOTECHNICAL CONSIDERATIONS

- 122. Please comment on the significance of the existing fractures and joints in the limestone bedrock.
- 123. Please comment on the specification and geometry for the fill materials relative to the porosity and functionality of the fish passage embankment.
- 124. Is it possible to achieve a minimum FoS of 2.2 for the design? Why or why not?

APPENDIX H - HYDROLOGY AND HYDRAULICS

- 125. Are the models used appropriate for the project? Why or why not?
- 126. Please comment on the assumptions for the proposed project.
- 127. Please comment on the design conditions and the calculated maximum velocity used for rock sizing.
 - a. Do you agree with the recommendations for boulder sizing?
- 128. Please comment on the target flow rate criteria and the methods used to calculate fishway flow rate.
- 129. Is the consideration given to flow through rip-rap adequate? Why or why not?
- 130. Please comment on the stated pool length, water surface drop per weir/riffle and boulder spacing recommendations and the methods used for deriving them.

APPENDIX I - STRUCTURAL CONSIDERATIONS

- 131. Please comment on the assumption that there will be less damage to a monolithic concrete structure from a flood water event.

132. Are debris and ice booms appropriate measures to reduce the side sway? Why or why not?
133. Are alternative approaches to the current use of crane barge an appropriate factor to consider? Why or why not?

APPENDIX J – PHASE I ENVIRONMENTAL SITE ASSESSMENT HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DOCUMENTATION REPORT

140. Please comment on the extent of the studies performed to rule out the possibility that “recognized environmental conditions” might interfere or delay implementation of the project.

APPENDIX K – REAL ESTATE PLAN

No questions

APPENDIX L – QUALITY MANAGEMENT: TECHNICAL REVIEW

No questions

APPENDIX M - MONITORING AND ADAPTIVE MANAGEMENT

See questions for Section 9.7.

APPENDIX N – PUBLIC INVOLVEMENT

No questions

APPENDIX O - TECHNICAL AND LEGAL CERTIFICATION

No questions

APPENDIX P - DISTRIBUTION

No questions

APPENDIX Q - PLATES

No questions